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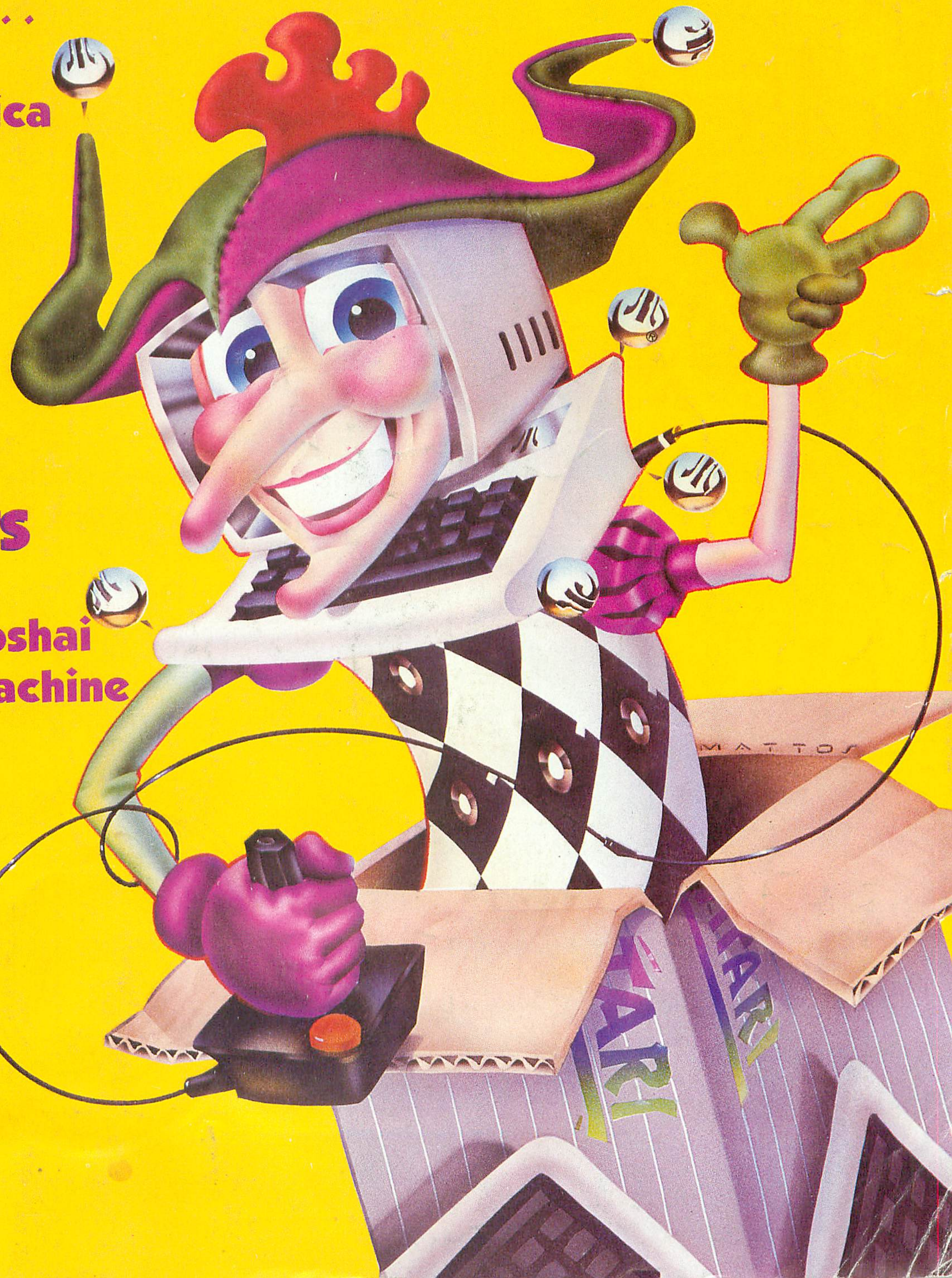
APRIL 1984 VOLUME 3, NUMBER 1

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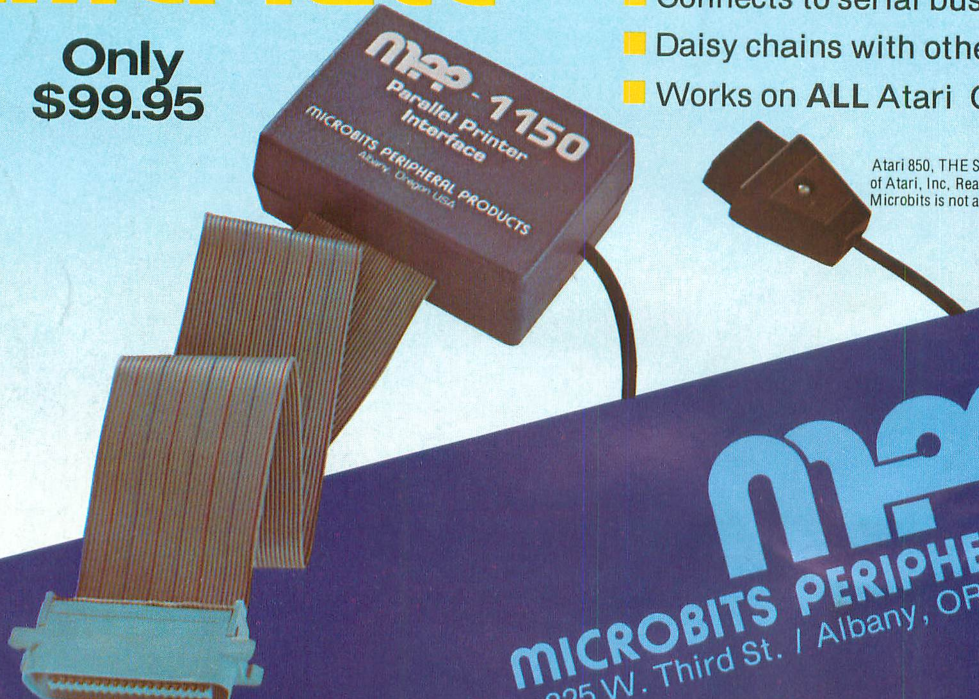
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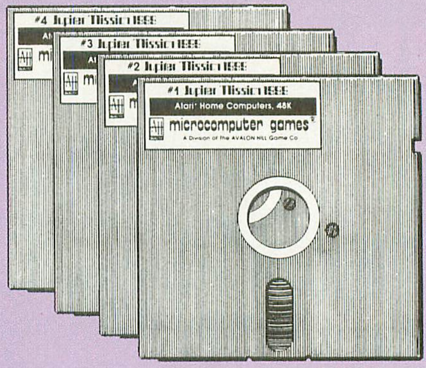

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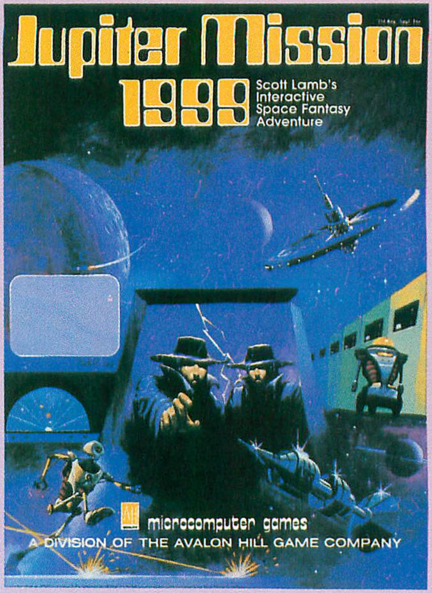
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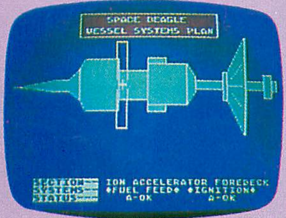
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Jupiter Mission 1999 is Avalon Hill's Trademark Name for its Microcomputer Space Adventure Role Playing Game.




Ship Status Display: Damage report




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Science Lab Display: Probe report




Science Lab Display: Jupiter system diagramatic

**RRRING!!! RRRING!!! RRRING!!!**

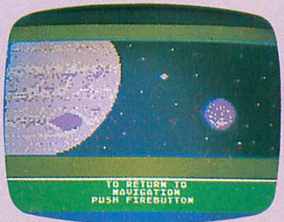
Too early on a chilly January morning, I was jarred awake by the noxious blaring of my traitorous doorbell. As I moved to accost the unknown aggressor, with the full force of semi-conscious wrath, I pulled on my robe and lost my dignity to the pain of a stubbed toe. Now fully awake, I opened the door, prepared to educate the mysterious interloper on the meaning of manners. My determination to this end was somewhat shattered when I saw two large men clad in long overcoats and wide-brimmed hats. Instinctively, I tried to slam the door. My retreat to safety was denied by the advance of the strangers. Before I could protest their entry, my vision was drawn to the shining silver badges that hung from their now unfolded wallets. They were government agents.

Hesitantly, trying to remember any crimes that I had ever committed, I invited them into my home. At their request, I produced my driver's license and other forms of identification. After examining these credentials, they asked me to pack a bag for an extended journey. After some protest and argument, I was made to understand that my options in this matter were less than limited. My country needs me, they said—with the clear implication that either I pack and dress or I take an extended journey in my robe.

This is how my adventure began. From my cold apartment, I was taken to a towering vehicle for an emergency mission to Jupiter. My very life on the line and, possibly, the survival of the planet Earth as well, and only God knows what other kind of perils await.

**JUPITER MISSION 1999** is a highly detailed role-playing space adventure game that includes challenging arcade segments and mystifying puzzles. **Four separate program disks** are enclosed to test the creative imagination of the advanced computer gamer. **JUPITER MISSION 1999** is ready to run on your Atari® Home Computer with 48K memory and one disk drive. **$50.00**

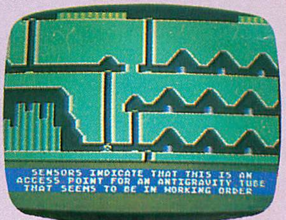
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Porthole View of Jupiter and a moon




Lander Approach Display: note descending spaceship



Exploring an Alien Complex



Exploring an Alien Space Station

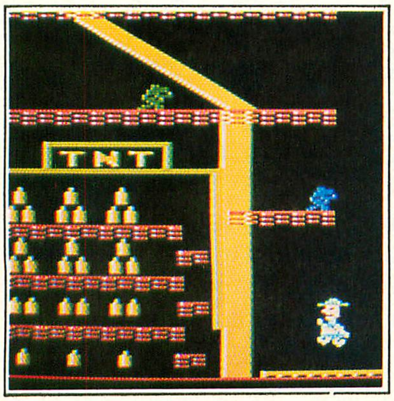


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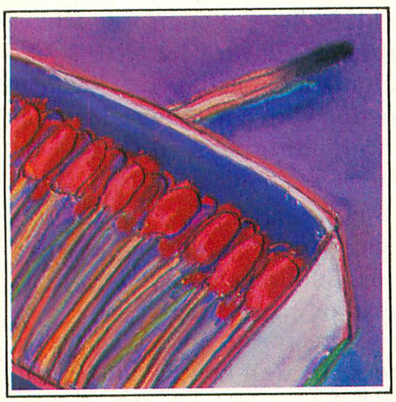
**Joystick required**

Antic®
The ATARI Resource APRIL 1984 VOLUME 3, NUMBER 1

★XL★ COMPATIBLE



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page 53



page 62

## FEATURES



## DEPARTMENTS

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April 1984
Volume 3, Number 1

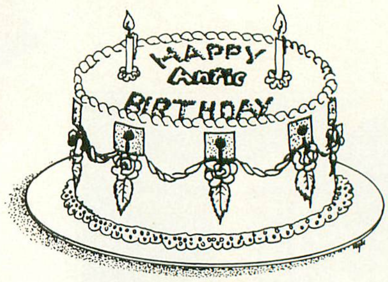
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Editorial submissions should include program listing on disk or cassette, and text file on media and paper if text was prepared with a word processor. Media will be returned if self-addressed stamped mailer is supplied. **ANTIC** assumes no responsibility for unsolicited editorial material.

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# editorial




With this issue we begin our third year of publishing and bringing you ANTIC — The Atari Resource. We extend our thanks to the entire ANTIC family of readers, retailers, subscribers, contributors, advertisers and staff. You are all involved every month in making ANTIC the very best source of information available to the Atari PC owner.

It seems the term PC has become generic, meaning personal computer. I believe it's time Atari owners (about a million of us by our count) start recognizing our machine for what it is, the very best personal computer you can get for less than $1,000.

We have achieved many of our goals this year. ANTIC "went monthly" and you got it monthly. We now sell more than 100,000 magazines per month, which makes ANTIC the largest selling Atari-only monthly periodical. We have set and met high standards for quality in material, art, color and production that leave our less dedicated competitors far behind. We have switched to perfect binding (square back) to make it easier to store ANTIC on your shelf.

We have developed a true monospaced type font for our listings that includes the special Atari graphics characters. In conjunction with our TYPO tables, this provides you with the most accurate, easy-to-read, and attractive listings found in any computer magazine.

What else did we do? Well, our first book is now reality, *The Best of Antic*. For only $12.95 we present 300 pages of articles and programs, including six never-before-published games. It's a small demonstration of our dedication to good value. (See advertisement and order form on pages 38 and 39.)

Well, that's last year; this computer business waits for no one. What are we planning? More of the same high-quality material by well-known and knowledgeable writers in the Atari world, continued dedication to accurate, readable listings, relevant product information and a genuine interest in things Atari.

Watch for a communications column, the how-to of the modern computer-telephone marriage. Also expect to see more information on education; as products mature, so will this department. You can expect to see some design changes in typeface and department names, all originating with the idea that you, our valued customer and fellow computer enthusiast, want your money's worth. After all, it is our communal interest that makes ANTIC successful.

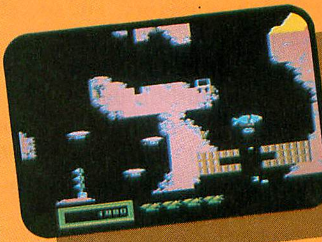
Look around at the other personal computers. Aren't you glad you own an Atari PC? Do you realize that even the Atari 400 is still essentially compatible with the newest computers in the Atari line? What other machines can make that claim? We have a community of interest built around the best eight-bit PC ever built, and ANTIC is proud to be a part of it.

James Capparell,
Publisher

# SYNAPSE SATISFIES!

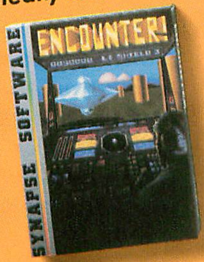




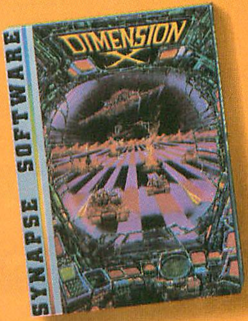
**Encounter**
Alone on a distant planet, you stumble into a futuristic 8-level tank battlefield that really plays for keeps! Watch out for the deadly drones and sneaky saucers.

Atari disk & cassette

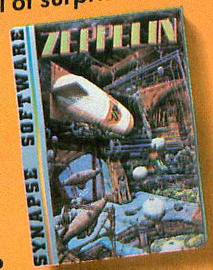



**Dimension X**
Test yourself with incredible 3-D action that never stops! An alien invasion fleet has the capital city surrounded, and it's up to you to stop the destruction! Good luck—you'll need it.

Atari disk & cassette




**Zeppelin**
First the prison break, but that's only the beginning! The underground world of Zarkafir is full of surprises, from the lethal energy fields to devastating earthquakes. Can you defeat the Timelords?




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# i/o board

## HELPING LETTER PERFECT

My favorite word processor for the Atari is Letter Perfect from LJK, but I've been frustrated by my inability to obtain a printout of the file directory on my storage disk. For some reason, LJK has customized their DOS and offset the disk directory by two sectors, compared to Atari DOS. Therefore, DOS can't find the directory. The secret is to POKE 4226,107.

Donald Nelson
Hillsborough, NC

*Thanks for the tip, Donald. We used your idea to write a short, easily modifiable routine that reads an LJK-file disk directory and sends it to the printer:*

```
10 DIM FILE$(20):POKE 4226,107
20 OPEN #1,6,0,"D:*.*":OPEN #2,8,0,
  "P:":TRAP 100
30 FOR I=1 TO 64
40 INPUT #1,FILE$:? FILE$: ? #2;FILE$
50 NEXT I
100 POKE 4226, 105: REM Back to normal
  DOS
```

—ANTIC ED

## TRAP GRAPHICS Ø ERRORS

I've written an error-trapping subroutine for inclusion with any Graphics Ø text program that prompts the user for a response. If the user enters information that would normally cause the program to crash (e.g., non-numeric data when the program expects a number), the subroutine traps the error at the line of the input statement. It saves that line number, briefly displays an error prompt, and returns to the line that contains the input statement. Line 2 is necessary to create the TRAP.

```
2 TRAP 31ØØØ:REM ERROR H
ANDLING ROUTINE
31ØØØ ERRORLNE=256*PEEK(
187)+PEEK(186)
31Ø1Ø ? "YOU HAVE MADE AN
 ERROR!":? "CAREFULLY ENT
ER YOUR RESPONSE AGAIN."
31Ø2Ø FOR ERROR=1 TO 15Ø
:NEXT ERROR
31Ø3Ø TRAP 31ØØØ:GOTO ER
RORLNE
```

Robert R. Ambrose
North Bellmore, NY

## TWO-COLOR PLAYERS

I am 12 years old. I recently received an Atari 800 and the 410 program recorder. I'm very interested in programming, and have recently learned about Player/Missile graphics. My question is, how do you make a two-color player?

Carlos Murillo
Garden City, NY

*Memory location 623 controls, among other things, various Player/Missile options. If you POKE 623, PEEK(623)+32, and then overlap two players, a third color will appear where they overlap. You can combine players 0 and 1, and players 2 and 3, to make as many as two three-color players. Our forthcoming* ANTIC's Book of Games *(working title) will include a Player/Missile Editor that allows you to experiment with this effect.* —ANTIC ED

## ANCHOR ADAPTOR

*Thanks in part to efforts by the ANTIC staff, the Atari version of the Anchor Mark XII 1200-baud modem (reviewed in ANTIC, page 109, February 1984) now comes equipped with a free adaptor. The adaptor lets you connect the modem directly to your 850 interface box; there is no need for additional cables or connectors. If you've already purchased a Mark XII, just return it to the factory for free installation of the adaptor.* —ANTIC ED

## THANKS FOR THE MEMORIES

Thank you for the flattering treatment you gave my graphics in your January "Microscreens" column. It was also nice to see the screen dump of one of my pictures elsewhere in the same issue (Product Reviews, page 109). I've been reading ANTIC for over a year, and enjoying it very much, but it had never occurred to me that I could be a contributor.

By the way, as a result of your column Gary Koffler of Datamost called to discuss my artwork. Also, your check made it possible for me to buy Movie Maker by Reston Software.

Guy Conrad
Woodside, CA

## A CHALLENGE

*Interested in winning a $1000 Atari computer system? If you're one of 12 winners in the second annual Computer EdGame Challenge, sponsored by Verbatim Corp. and Scholastic Inc., that will be your prize. Simply submit a nonviolent educational game for use on the Atari 400, 600XL, 800, 800XL, or 1200XL computer by April 30, 1984. Contest categories include mathematics, language arts, sciences, health/nutrition, and geography/social studies.*

*For further information, call (212) 505-3485 or write to: Computer EdGame Challenge, Scholastic Inc., 730 Broadway, New York, NY 10003.* —ANTIC ED

## IS THERE A 1025?

I've been trying to get information about the Atari 1025 printer recently — so far without success. ANTIC's January issue featured printers, but it didn't include anything on the 1025! Why not? Is there a 1025?

Arthur R. Thom
Palm City, FL

*Our most recent information from Atari indicates that the 1025 printer has not been discontinued, and is, in fact, available in most parts of the country right now. However, as is the case with the 600XL and 800XL computers, distribution has been delayed in some areas.*
—ANTIC ED

## A VOTE FOR UTILITIES

I want to commend you on "Typer's Toolbox" (ANTIC, page 75, January 1984). It was an exceptional utility program. I just completed a program that included thirty DATA statements without making a single error! Keep up the excellent work. I hope to see more such utilities in the future.

Larry Lewandowski
West Seneca, NY

*You will. In particular, keep an eye on our new department, "The Tool Box," which will feature utility programs from the prolific workshop of Jerry White.* —ANTIC ED

continued on page 10



**W**hat do voice synthesizers have in common with movies?

They don't make them like they used to.

Because now there is S.A.M. The Software Automatic Mouth.™ The first software-only speech synthesizer for Commodore 64, Atari and Apple computers.

Developed by Mark Barton of Don't Ask Software, S.A.M. is designed to give you all the power of conventional hardware speech devices. Without the hardware.

And without the high price.

S.A.M. is the program that makes other programs talk. Business programs. Educational programs. Recreational programs, too.

You can use it in any number of useful ways.

To write instructions that talk. Stories that tell themselves. And creative new games with characters that converse or opponents that crack jokes.

And you can do it all with ease. With phonetic or plain English input.

S.A.M. can say anything you like, any way you like—you choose the pitch, tone, speed and inflection.

If you want, you can even choose the voice.

Here's talking to you, kid.

*(The Apple version includes an 8-bit digital-to-analog converter and audio amplifier on a card. It requires 48K and a speaker. The Atari version requires 32K.)*

# Say it again, S.A.M.



# i/o board

## WHAT, NO MAY ISSUE?

*Your next issue of ANTIC will be dated June 1984. We will not publish an issue this year with a May cover date. However, we are* not *skipping an issue! We're simply adjusting our cover date to allow more time for distribution and to give ANTIC a longer shelf life in retail outlets.*

*The June issue will be Volume 3, Number 2. There will be 12 issues in this volume, and all subscriptions will be automatically adjusted to ensure that you receive the proper number of issues.*

*Distribution of the June issue will begin in early May. Subscribers should receive their copies by the middle of the month.* —ANTIC ED

## LIFELINES

Because the word "computer" scares the living daylights out of nearly everyone where I live, I depend on my subscriptions to keep me informed. The only other sources of information I can depend on are the various bulletin board systems located around the country. You should see my phone bill! Keep up the good work!

David Roling
Hannibal, MO

## DESPERATE TO DOWNLOAD

I recently purchased an Atari 835 direct-connect modem with Telelink II software. I was very disappointed to find that this package isn't capable of uploading or downloading. Can you tell me what terminal software will allow me to upload and download with my modem?

David McMahan
Princeton, TX

*You're right, the 835 can't download or upload with Telelink II, and you can't use terminal programs other than Telelink II with the 835, because the system doesn't employ an RS232 interface. However, this situation is about to change. Atari Product Support has announced the availability of a new handler for the 835. If you incorporate this handler into your own terminal program, such as JTERM or AMODEM, it will allow you to upload and download with the 835. For further information, contact Atari Product Support, P.O. Box 61657, 1312 Crossman Ave., Sunnyvale, CA 94088.* —ANTIC ED

## HELPFUL HINTS

As an owner of an MPP-1100 Printer Interface from Microbits Peripheral Products, I heartily agree with your review of the product (ANTIC, page 109, November 1983). It is indeed a practical, economical product. However, it is not compatible with all software. Early versions of Zaxxon will not work with it, but Datasoft will exchange such programs for a compatible version at no charge. Also, Monkey Wrench II does not work with the MPP ROM installed. There is no known fix for this.

Also, a word of caution to those who intend to purchase AtariWriter. If you use the program with a printer that is not manufactured by Atari, you may need to buy a printer-driver program for $25 from APX (Atari Program Exchange). This lets you employ special printing functions such as underlining, boldfacing, and both super- and subscripts. Or you can do without it, by embedding appropriate hexadecimal print-format codes into the text.

Here's a hint that makes that chore easier. Instead of typing in the string of codes, type in a character that isn't used in your text, such as an asterisk(*). Then use the search-and-replace function to replace each occurrence of that character with the code string.

Joseph F. Carroll
Westminster, MD

## GEMINI SCREEN DUMP

The Screen Dump program by Jerry White and Fernando Herrera in the January issue (ANTIC, Screen Dump, page 73) is great. But to get it to run properly on my Gemini 10 printer, I had to change line 120 to read as follows:

```
120 CLOSE #1:OPEN #1,8,0,"P:":
?#1;CHR$(27);CHR$(64);CHR$(27)
   ;CHR$(51);CHR$(16)
```

Note the last two characters. CHR$(51) tells the printer to prepare for the n/144" line feed; CHR$(16) sets the line feed at 16/144" (1/9"). This eliminates the extra line space created by the original program.

Jim Thompsen
Brentwood, NY

## DISCOVERING ANTIC

I recently purchased an Atari 800 and a disk drive, and then discovered ANTIC. All I can say is that if I'd known about your magazine earlier, I would have purchased my Atari sooner. I consider ANTIC to be the bible for the Atari owner, and I want to compliment the entire staff. You make computing fun.

Gary Silverman
Teaneck, NJ

## NOTE AND POINT

I look forward to receiving every issue of ANTIC, particularly those in which you survey peripherals (such as your January 1984 printer survey). So many different peripherals are available for Atari computers that it can be very difficult to decide which to buy. As a result, I hope that you'll continue to publish such articles.

I also hope to see some articles in ANTIC about using data files on disk, and I'm especially interested in the use of random files with NOTE and POINT.

Anita Gould
White Plains, NY

*Thanks for the kind words. We'll certainly continue to survey peripheral products that are of interest to Atari computer users. In fact, we're planning to publish a disk drive survey in our June issue. By the way, a tutorial by Jerry White on the use of NOTE and POINT ("Disk Update Using NOTE and POINT") appears in this issue.* —ANTIC ED

## A=USR REBOOT

It is a documented fact that POKE 580,1 and [SYSTEM RESET] will do a cold start boot. But did you ever wish you could do the same thing from a program? A simple A = USR (61733) will do a complete reboot of the system. This happens to be the address of the "reset" on the 6502 processor.

Vern L. Mastel
Mandam, ND

# OMNITREND'S

# UNIVERSE

For 200 years the people of Axia, the central planet in a cluster of colonies known as the Local Group, have relied on spacecraft from Earth for economic support. The spacecraft, propelled by Earth's prized Hyperspace Booster, arrive regularly at Axia, carrying Earth's latest technological advances and trained personnel. These shipments from Earth are strictly one-way, because the Local Group does not have a Hyperspace Booster; Earth has been dispatching the ships based only on her faith in the colonists' ability to survive.

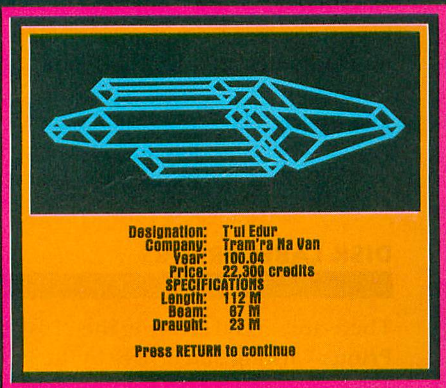
Four months ago, the expected ship did not arrive. The colony has been caught in a wave of desperate concern and wild speculation, for without Earth's assistance, technological deterioration is certain.

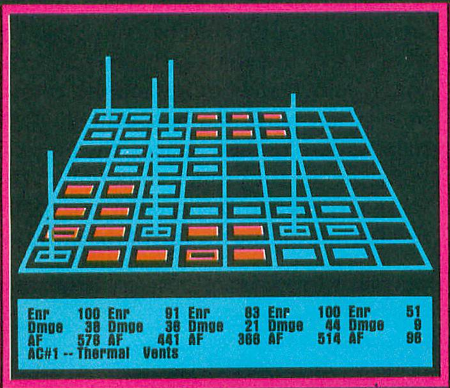
Fifteen days ago, evidence of a second Hyperspace Booster, lost somewhere in the Local Group, surfaced. Discovery of this second Booster would mean a fortune for those who found it, and would renew contact with Earth; failure to find the Booster would mean the eventual destruction of the colonies. You and your colleagues have decided to search for it.

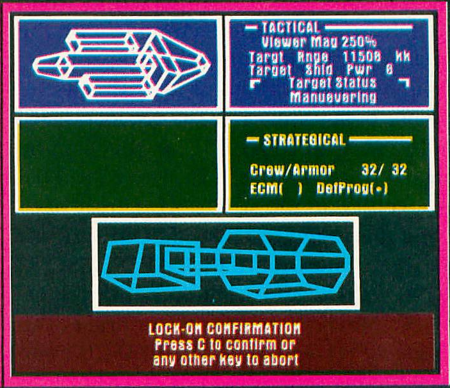
Your search takes you through a multitude of star systems and planets, using true three dimensional flight, orbits, and orbital transfers. But your voyage will not be free. You must earn money to maintain spacecraft and crew. You will need to use your ship for passenger transport, mining, trading in exotic goods, or, for the desperate, piracy. You may need to defend yourself, for there are others who are eager for profit and power. You will have to construct the spacecraft most suited to your endeavor and decide what is needed to survive in deep space while contending with unknowns.

This real time game, with hundreds of kilobytes of data, features intelligent enemy ships and total control of on-board facilities such as computers, high-resolution scanners, weapons, assault capsules, ore processors, orbital shuttles, rescue pods, and much more.

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Omnitrend's Universe™ fits your ATARI® 600, 800, or 1200XL computer. Requires 48K and one Atari® 810 or 1050 disc drive.
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Terms and Conditions • Personal/Corporate checks allow 15 days to clear • COD orders (cash or certified check) accepted. $10.00 non-refundable surcharge • Master Card, Visa and Wire Transfers, include telephone number • All Connecticut residents, add 7 1/2% sales tax • Shipping, Handling and Insurance $4.00 minimum per unit, additional $3.00/unit for UPS Blue Label • Alaska, Hawaii, and export orders subject to additional charges • Call before returning merchandise for replacement. Returns must be accompanied by RMA number • Prices subject to change without notice. • Dealer/Distributor inquiries solicited
Omnitrend's Universe™ will soon be available for the IBM-PC, Apple II, and Zenith Z-100.



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# help!

## MICRO MISTAKE

In the February 1984 issue (ANTIC, page 8, I/O Board), we described a way to save pictures drawn with Koalapad and Micro Illustrator in a standardized format that is compatible with other drawing programs (such as Micro-Painter). We also noted that there is a way to load such pictures into Micro Illustrator, but that it didn't work when we tried it. However, we've since discovered that you *can* load and use a standard-format picture if you refrain from using the icon menu.

To save a picture in standard format, insert a disk with at least 62 free sectors, and press [INSERT] on the keyboard while the picture is being displayed. The picture will be saved as a file named PICTURE. To load the file (or any standard-format picture file, if you first rename it to PICTURE with DOS), press [CLEAR] while the drawing screen displays, rather than the icon menu.

## POINTS OF ORDER

"Atari and the Epson" (ANTIC, page 65, January 1984) pointed out some very useful techniques. However, I also discovered a few inaccuracies. First, I must disagree with Mr. MacKay's claim that superscripts aren't available if you use his technique with the Atari Word Processor and the Epson.

Superscripts can be used with this sequence of keystrokes: [CTRL INSERT] [ESC] [S] [CTRL INSERT] [CTRL ,]. They can be turned off with [ESC] [T], not [CTRL] [H] as specified in the article. Also, instead of using the suggested [ESC] [@] to turn off the underline, use [CTRL INSERT] [ESC] [-] [CTRL INSERT] [CTRL ,]. In both of these cases, MacKay seems to confuse the character Ø (zero) with the ATASCII code O, which is represented by [CTRL] [,].

The sequence for turning on the underline feature is also incomplete. The proper sequence is: [CTRL INSERT] [ESC] [-] [CTRL INSERT] [CTRL A]. To turn on the double-width feature, use [CTRL INSERT] [ESC] [W] [CTRL INSERT] [CTRL A]. To turn it off, use [CTRL ,], not [CTRL A]. Double width remains in effect until you turn it off, not just for one line as MacKay states.

The article prompted me to try every conceivable control code, and I've yet to find one that cannot be used in this manner. By the way, please pass my name and address along to your readers. I'm anxious to correspond with other ANTIC readers about computer topics.

Julio Trujillo
103-695 W. 17th Ave.
Vancouver, B.C.,
Canada V5Z 1T7

## WRONG NUMBER

The phone number listed for the Mobile Fidelity Sound Lab in your August 1983 issue ("Get Your Head Straight," page 68) is incorrect. The number given in the article reaches a private residence. The correct number is (213) 709-8440.

Richard Luxbacher
Newport, PA

*Thank you for pointing out our error. Our apologies to all concerned.* —ANTIC ED

## TYPER'S TOOLBOX

There are two minor errors in the listing for "Typer's Toolbox" (ANTIC, page 75, January 1984). They produce a different TYPO table than the published table, but do not prevent the program from running properly.

Line 30160 has an extra space immediately following the right parenthesis in '(no lines lost)', and line 30390 has an extra space immediately following the comma in 'ANY line range may be specified,'. If you remove both of these spaces, the program will generate the proper TYPO table. This will also generate the proper format of the printed line during the run of the program.

### HELP! Yourself

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## NO ROBOTS?

What happened to the robotics articles by Evan Rosen? I'm sure that I'm just one of thousands of ANTIC readers who bought a servo kit and put it together as described in the January issue (ANTIC, "Has Your Robot Hugged You Today?", page 38). I expected that, as promised, the series would continue in the February issue. Imagine my surprise, and consternation, at finding no continuation in the February issue, and no explanation for this. I feel that I have a right to an answer.

Ken Hecker
Fullerton, CA

*Several factors — some beyond our control — prevented us from continuing Rosen's series on robotics in the February issue. As a result, the next installment in the series will not appear until June. We apologize for any inconvenience that this interruption has caused our readers.* —ANTIC ED

## ROAD RACE

There is an error in the listing for "Road Race" (ANTIC, page 97, January 1984). The end of the second physical line of line 380 should read "? SCR", not "? S CR". Also, to keep the screen from changing colors after nine minutes of play, add line 286 as follows:

286 POKE 77,0

Ray Brown
Broken Arrow, OK

## DISK LABEL ERRORS

There are several errors in the "Disk Label Printer" listing and article in the January 1984 issue of ANTIC. First, as mentioned in the article, CHR$(0) should be appended to line 37 for condensed mode. The next two corrections apply to the conversion of the program for use with 3½" labels. Instead of changing the 40 in line 137 to 32, change it to 30. Also, change the 4 in line 314 to 3.

If you're using a Gemini 10X printer, you'll need to adjust the line spacing. Change the 18 in line 33 to 12.

Chuck Reed
Emerado, ND


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# BIOMECHANICS AT THE OLYMPICS

## Computers and the Olympic effort

by DAVID F. BARRY

Computers are alive and well at Coto de Caza, California, the training grounds of the Atari-sponsored U.S. Women's Volleyball Team which is now favored to capture the gold medal in this summer's Olympic Games in Los Angeles. Atari computers are used to decipher volleyball statistics in the office of the team's coach, Dr. Arie Selinger; down the hall, Dr. Gideon Ariel, the dean of modern sports science, takes advantage of computer power to study biomechanics, the science that links the physics of movement to human anatomy.

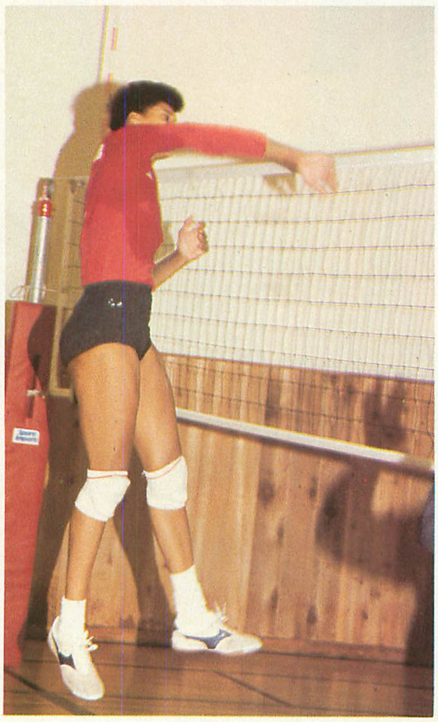
### COMPUTERS TO THE RESCUE

Though biomechanical study existed before Dr. Ariel's arrival on the scene—it was painstakingly studied by means of slow motion film—it wasn't until Ariel discovered how to quantify such information with the computer that biomechanics blossomed. The task wasn't an easy one; it took more than 10,000 hours of programming time to develop the essential software for the field.

But now, Dr. Ariel can study any movement, no matter how minute, and can reproduce it on his video screen as a three-dimensional graphic image. Any sport can be quantified. After all, "Movement is movement," Ariel notes, maintaining that all movement obeys the laws of Newton's universe.

### DIGITIZING MOVEMENT

The secret of Ariel's procedure (and the missing element for a long time in biomechanics) is the digitizer, a screen



JOHN DROOYAN

Flo Hyman

lined on two sides by 20,000 tiny directional microphones. Any coordinate on the screen that is touched by a special magnetic pen is immediately recorded by the computer.

To be digitized, a movement must first be photographed with high-speed cameras from a number of angles. Once these shots have been developed, they're projected onto the digitizer screen; Dr. Ariel then traces the significant points of the motion with a magnetic pen. The computer then interprets these impulses and projects the data to a video display as a three-dimensional graphic image of the movement.

The end result is a fascinating method by which movement can be analyzed and studied. Such data as speed, force, and displacement are instantly available. Whether it's studied in slow motion or in frozen multiple images (or as seen from the top, the side, or the front), a movement sequence can be taken apart like a toy airplane. It can be played and replayed, and run backwards, forwards or in freeze-frames. Hypothetical variables can be substituted for real ones. What if, you want to know, the ball were hit this hard, at this angle, and in this direction? Results are immediately available.

### COMPUTERIZED SPIKES

Flo Hyman, a member of the U.S. Women's Volleyball Team, is considered to be one of the finest spikers in the world. After a few sessions with Dr. Ariel, she discovered that she was hitting the ball too late on her spikes—one inch into her downward motion. This caused her to hit the ball when she wasn't fully extended, which re-

continued on page 16

**A MATTER OF BIOMECHANICS**
continued from page 14

sulted in a loss of velocity. By correcting this, she was able to increase the


JOHN DROOYAN

The computer projects a digitized image of Flo Hyman preparing to spike.

speed on her spike.

Dr. Ariel also uses biomechanics to study the movements of the U.S. team's opponents. He did this by photographing the top teams that compete against the U.S. in international competition—China, Japan, and the Soviet Union. After digitizing this data at the Coto Research Center, he discovered a number of interesting things. He demonstrated one of them for me by pressing a few keys on the computer; this entered the coordinates of an x-y axis, which in turn oriented the picture at the proper angle. Suddenly, an image of a net and several figures on each side of it appeared on the screen.

"Here's Flo Hyman going to spike into the Chinese team," Ariel explains. A thick Israeli accent is still present, even after 19 years in the U.S. "The question is, where should she spike? You cannot simply spike at random."

Dr. Ariel taps at the keyboard again, entering more data. The figures animate, and the stick figure of Flo Hyman rises up to meet the small, white image of the ball. Ariel freezes the picture.

"Now look," he notes. "She hasn't even touched the ball and yet they [the Chinese team] have already committed." Sure enough, all of the Chinese figures have committed themselves in anticipation of the spike.

"Since they always do the same thing," Ariel continues, "we can tell her to make sure that she always spikes to the point where the other team is the weakest.

"This is how we're beating the Chinese, the Japanese, anybody in the world. Utilizing this kind of sophisticated statistical analysis. It's like playing poker with someone and knowing what cards they're holding."

## A HIGH-TECH BAN

Soon after the U.S. began winning international tournaments, the rest of the world caught on: Ariel and his cameras were banned from international competitions. But not before Coach Selinger had the information he needed.

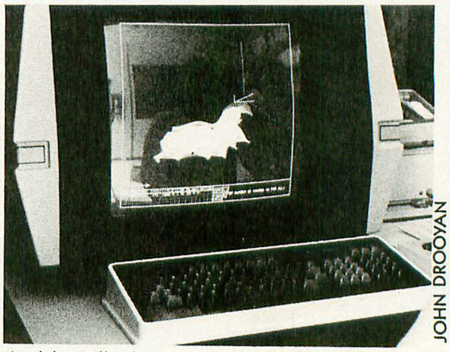
As Selinger explains, "With the computer, you immediately have all this data available. You know how high the ball was set, how much time was available, how fast the Chinese block moved, how fast the ball was moving. All the information is there."

"I don't want to say that I help any athletes," Dr. Ariel notes with cautious modesty. "You can't say you help anybody. We provide the tools that help them to excel. But the minute you start taking credit for anything, you upset the coach . . . you upset everybody."

## THE ROAD TO SUCCESS

Dr. Ariel has had plenty of interaction with coaches. He threw the shot-put for Israel in the 1960 and 1964 Olympics, and while studying for his Ph.D. in computer science at the University of Massachusetts (Amherst), he served as an assistant track coach. It was at that point that the idea of linking computers to sports came to him. "Why not combine Rocky with Star Wars?"

Until then, Ariel had to laboriously trace every segment of a movement on paper, limb by limb, frame by frame. What he needed was a way to quantify this information. He found his answer while visiting Dartmouth's medical school: the digitizer screen.


JOHN DROOYAN

A video display of a completed spike.

After making this breakthrough, he launched his first business, Computerized Biomechanical Analysis, and quickly landed a few major sporting contracts. These contracts gave him the money to delve deeper into biomechanical research, which, in turn, eventually resulted in an invitation by the U.S. Olympic Committee for him to become its director of research in biomechanics.

As the U.S Women's Volleyball Team enters the home stretch in its race toward a potential gold medal, Gideon Ariel can stand back and gain a good deal of satisfaction from his contributions to the team. As he so modestly maintains, "I don't want to say that I help any athlete. We simply provide the tools that allow them to excel."

But those tools have revolutionized the way that these Olympic athletes look at their bodies in motion, and have provided them with a major boost in their attempt to scale the Olympian heights.

*David F. Barry is a technical writer in the computer field, and the author of an upcoming book on the word-processing program Wordstar.*

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# TALK TO YOUR PERIPHERALS

## Disk modifications from BASIC

by WILLIAM W. HOUGH

### SYNOPSIS

*This article's listing is a subroutine that you can add to your own BASIC programs to gain control of functions that are normally accessible only from DOS. The subroutine requires BASIC and Atari DOS, and runs on all Atari computers.*

After spending hours typing in a BASIC program, have you ever tried to save it to disk, only to find that there wasn't enough room? And, of course, that there wasn't another formatted disk to be found for love or money? If this has happened to you, you're not the first. Atari's solution to this dilemma is the MEM.SAV feature of DOS. But what happens if you don't have MEM.SAV on your disk?

Recently, I worked on a progam that frequently wrote lengthy files to disk, and I ran into this problem more than once. I needed a way to access DOS commands from BASIC. Then it occurred to me that the long-forgotten XIO commands from the abandoned BASIC Reference Manual might be of service.

The program listing presented here is a subroutine you can add to any BASIC program that requires access to DOS functions. It allows you to use the Directory, Lock, Unlock, Erase, and Rename file functions, and it can even format a new disk.

### PLANNING FOR EMERGENCIES

Keep a LISTed copy of the subroutine on your utilities disk. If you ever encounter the situation mentioned above, add the subroutine to your program with the ENTER command. Then type — in immediate mode (with no line number) — GOSUB 29700.

### HOW TO USE THE PROGRAM

The subroutine is quite straightforward. I've used unusual line numbering to keep it "above" most user programs, but "below" other ENTER-type utilities, like renumbers, which commonly use a line range above 30000. Type in the subroutine, then LIST it to disk. Use ENTER to merge it with your program. When you want to use DOS functions, just insert the command GOSUB 29700 into your program.

### PROGRAM DESCRIPTION

Line 29700 clears the screen and causes the DIM statements to be skipped if they've already been executed. Lines 29720 to 29740 contain the disk-directory routine. The POKE in line 29750 ensures that an upper-case response is provided to the prompt that asks you if you want to change the disk. If the answer to this prompt is "No," you're done. If it's "Yes," line 29790 prompts you to specify the function you need. Lines 29800 to 29840 set the command byte for the XIO statement, depending on the function you've selected. If you're using Rename, line 29820 prompts you for "Oldname,Newname." It's important to enter the names in this format. For the other functions — Lock, Unlock, and Erase — we branch to line 29860, which prompts you for a filename. Line 29870 prefixes the "D:".

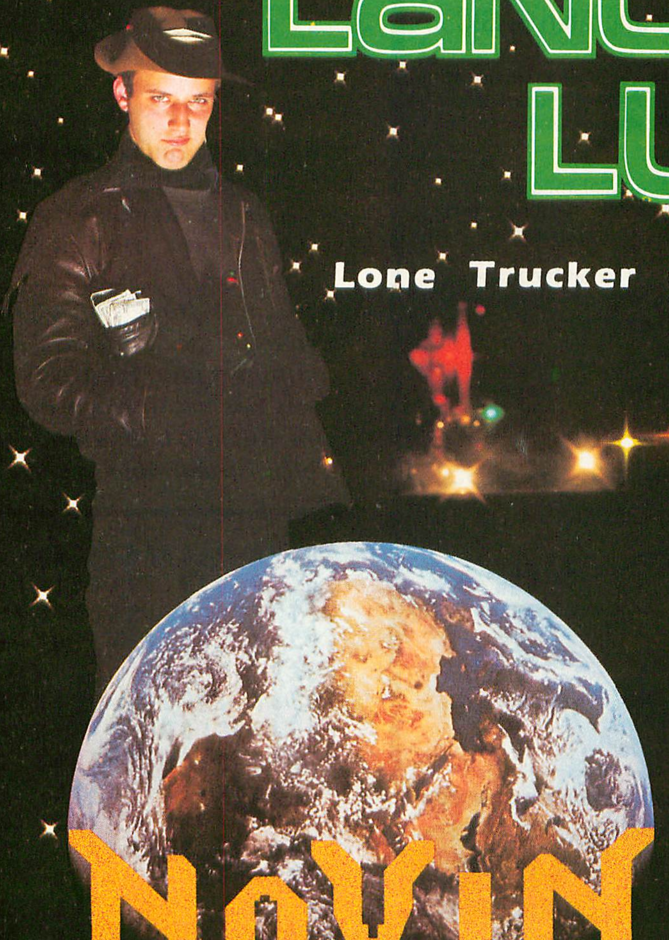
Two of these functions, Erase and Format, have the potential to partially or completely destroy the data on your disk. Therefore, in lines 29890 to 29910, you're asked, "Do you really mean it?" Line 29880 skips this section if a non-destructive function has been selected.

This leads us to line 29930, the promised XIO command. We've determined the command byte, CMD, and the filename, CHFILE$. The channel number (1) and the two auxiliary bytes (the two zeros) are unimportant here, but are required by BASIC. The TRAP in this line causes execution to branch to line 29950 in the event of a mistyped filename or other error. Lines 29780, 29850, and 29910 perform a similar function if you mistype a response to other prompts. Line 29950, which is essentially a one-line subroutine, causes the screen border to flash red and the

continued on page 20

# $Lance Lucre

## Lone Trucker of the Spaceways!™

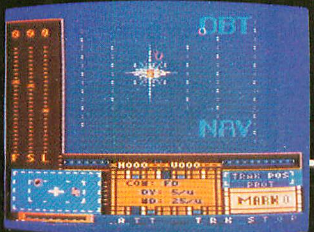


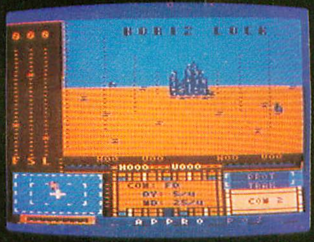
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## starting line

continued from page 18

computer to emit a nasty sound if you've made a mistake. If a change to the disk is successful, the altered directory is displayed. To exit the subroutine, simply answer "No" to the prompt "Do you want to change the disk?"

*William W. Hough, an engineer with degrees from Northwestern and Stanford, has been interested in microcomputers for a relatively short time, but mastering the Atari has become a principal leisure-time activity for him. Bill also is the author of a logic game, Brainboggler, which is available through Educational Software, Inc.*

```
29700 ? CHR$(125):IF SECOND THEN 29720
29710 DIM FILE$(27),CHFILE$(27),ANS$(1
),TXT$(20):SECOND=1
29720 CLOSE #1:OPEN #1,6,0,"D:*.*":TRA
P 29740
29730 INPUT #1,TXT$:? TXT$:GOTO 29730
29740 CLOSE #1:TXT$="":TRAP 40000
29750 POKE 702,64:? :? "Do you want to
 change the disk ";
29760 INPUT ANS$:IF ANS$<>"Y" THEN TRA
P 40000:RETURN
29770 GOTO 29790
29780 GOSUB 29950:GOTO 29760
29790 ? :? "LOCK, UNLOCK, RENAME, ERAS
E or FORMAT"
29800 INPUT ANS$:IF ANS$="L" THEN CMD=
35:GOTO 29860
29810 IF ANS$="U" THEN CMD=36:GOTO 298
60
29820 IF ANS$="R" THEN CMD=32:? :? "En
ter OLDNAME,NEWNAME":GOTO 29870
29830 IF ANS$="E" THEN CMD=33:GOTO 298
60
29840 IF ANS$="F" THEN CMD=254:CHFILE$
="D:":GOTO 29880
29850 GOSUB 29950:GOTO 29800
29860 ? :? "Enter FILENAME ";
29870 FILE$="":INPUT FILE$:CHFILE$="D:
":CHFILE$(3)=FILE$:IF FILE$="" THEN GO
SUB 29950:GOTO 29870
29880 IF ANS$>"F" THEN 29930
29890 ? :? "Do you really mean it ";
29900 INPUT ANS$:IF ANS$="Y" THEN 2993
0
29910 GOTO 29700
29920 GOSUB 29950:GOTO 29900
29930 TRAP 29940:XIO CMD,#1,0,0,CHFILE
$:GOTO 29700
29940 GOSUB 29950:GOTO 29700
29950 POKE 712,68:? CHR$(253):POKE 712
,0:RETURN
```



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# MATH WIZARD

## An educational shoot-em-up

by MATTHEW RATCLIFF

Math Wizard allows you or your children to practice addition, subtraction, and multiplication problems at different skill levels.

**SYNOPSIS**

*This program presents a basic arithmetic drill in a colorful, arcade-style format. It requires 16K RAM (24K for disk), BASIC, and a joystick, and runs on all Atari computers.*

### HOW TO ENTER THE PROGRAM

Lines 20 through 80 contain two machine-language routines in the form of strings. Refer to the Listing Conventions table in this issue (see the Table of Contents) to help you type in this section. The seventeenth character in line 40 (which is also present in line 60) is an inverse-underline character. To produce it, press the inverse-video key, hold down [SHIFT], and press the minus [–] key. Check your typing with TYPO, and don't run the program until it checks out, or it may lock up the computer.

### HOW TO USE MATH WIZARD

RUN the program. Math Wizard's first display consists of a menu of game options. Plug a joystick into Port 1. Move the stick up and down to position the flashing cursor and select different options. Pushing the stick to the left or right changes the value of the selected option. If you hold the joystick steadily in either of these positions, the change of values will gradually accelerate to make a wide range of values easily accessible. Options include:

- Minimum starting number — The smallest value (MIN) to be used in the math problems.
- Maximum starting number — The largest value (MAX) to be used in the problems. This value must exceed the minimum starting number by at least five.
- % Correct to Advance — Each round consists of six problems. To proceed to the next round, in which both MIN and MAX increase, your score must match or beat this value.
- Difficulty Increment — The number by which MAX will increase after each round.
- Rounds per Game.
- Problem Type.

The high score, most recent score, and problem type for the high-score game are displayed near the top of the menu screen.

### HOW TO PLAY

Press the fire button to begin the game. The number of the current round, the problem number, and your percentage of correct answers appear at the far right. At the top of the screen the current problem type appears; below that is an answer box. As the round begins, six problems scroll toward the bottom of the screen, where you're stationed with a number blaster (the flashing cursor). Position the cursor under the problem whose answer corresponds to the one displayed in the answer box above. Press the fire button to select the problem. If more than one problem has the indicated solution, choose the one that is nearest to the cursor. This will save time, and earn you more bonus points at the end of the round.

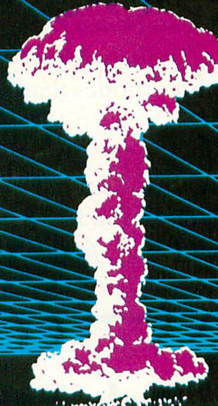
If you're correct, you'll blast the problem back to the top of the screen and the correct answer will appear underneath it. Then the next answer will be displayed and the scrolling will continue. If you're wrong, the scrolling continues, but nothing else happens.

Should any of the round's problems reach the bottom of the screen unanswered, each will scroll back up to the top, and its correct answer will be displayed. If your percentage of correct answers is below the minimum, you have to play another round with the same values of MIN and MAX. If your percentage is high enough, you receive a bonus score based on your speed. Your score is based on your number of correct answers, plus bonuses. Any incorrect answer's value is deducted from your final score.

continued on page 24

# Is It a Game — Or Is It Real?

## NATO COMMANDER





Nato Commander is available for Atari and Commodore 64 computers, 48K disk or cassette. IBM-PC version will be available shortly.

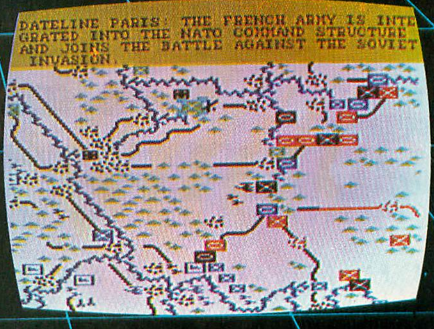
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**MATH WIZARD** continued from page 22

## MACHINE-LANGUAGE ROUTINES

Math Wizard uses two machine-language routines, which are found in the strings GTX$ and CX$ in lines 20 through 80. GTX$, called GRAFTEXT, lets you add text to a graphics screen. CX$ is a Mode 8 multicolor routine. It fills a Graphics 8 screen very rapidly with a specified byte or with random values.

Line 90 contains an example of the calling format for GRAFTEXT. If you add the statement GX = ADR(GTX$), you can use GX as the first parameter: A = USR(GX,ADR (B$),LEN(B$),X,Y). This puts string B$ on the screen at coordinates X,Y in Graphics Modes 4, 6, or 8. If you use the form A = USR(GX,ADR(B$),LEN(B$),X), it puts B$ on the screen at X; the Y position is taken from the cursor's current position (set by the most recent PLOT, DRAWTO, or LOCATE command). The form A = USR(GX,ADR("TEXT"), 4) displays 'TEXT' at the current cursor location. The call A = USR(GX,ADR("X")) displays 'X' at the current position. If you omit the length parameter, the default value is one.

An example of an invalid call to GRAFTEXT is A = USR (GX). This call would cause the console buzzer to sound, and return control to BASIC. If a USR call contains too many parameters, GRAFTEXT uses what it needs, cleans up the stack and provides a safe return to BASIC.

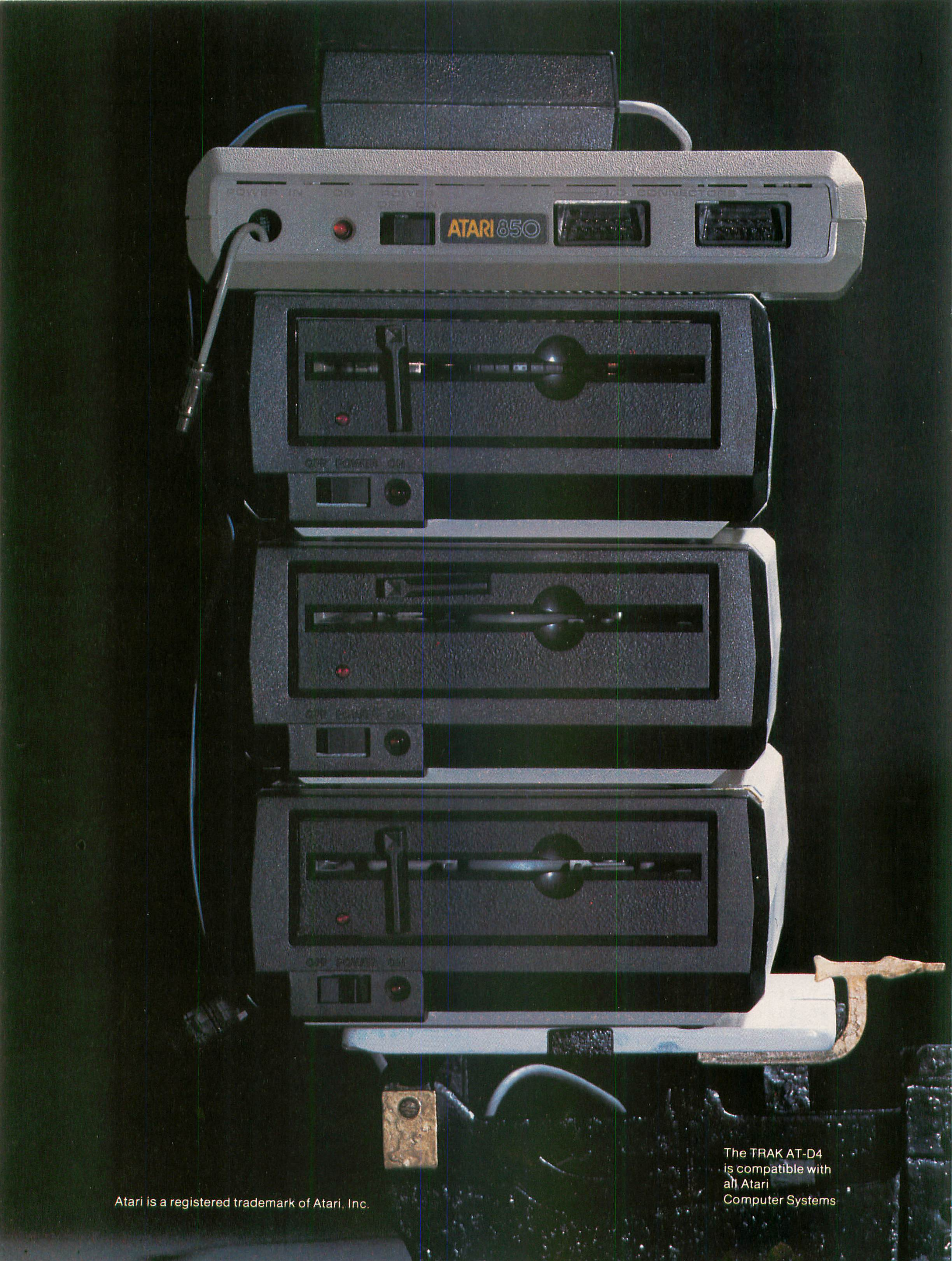
For the best results with the Mode 8 multicolor routine, first call Graphics 8 and set the background to black as follows: GRAPHICS 8+16:POKE 710,0. The statement A = USR(ADR(CX$),165) fills the screen memory with the byte value 165. Permissible values range from zero to 255. Different values cause varying degrees of artifacting, which result in a number of multicolor combinations. To fill the screen with random values, omit the second parameter: A = USR(ADR(CX$)). This creates an interesting display, but is of limited usefulness. This routine can also be used in GTIA Modes 9, 10, and 11. It modifies 7680 bytes of memory, so it shouldn't be used with graphics modes that require less RAM.

*Matthew Ratcliff is an electrical engineer and microcomputer enthusiast. He owns a customized Atari 400 with 48K, and has been programming in BASIC for six years.*

```
5 REM MATH WIZARD
6 REM BY MATHEW RATCLIFF
7 REM ANTIC MAGAZINE APRIL 1984
10 DIM GTX$(333),B$(40),CX$(55):CX=ADR
(CX$):GX=ADR(GTX$)
20 GTX$(1,60)=")L%TdU%bV%c&W)(hp(hYhXJp#hh
Jphchb"
30 GTX$(61,120)="JphhdJphhJPp)LL$
V%]+)U"&U ed fUJPoT"^%b+
%"
40 GTX$(121,180)="c*E^e^f+JPr%X
eTT%YeUU%eTTfU%TV%UW 1XfXPf
Y""
50 GTX$(181,240)="hI)Fh*0)@
 )eZ"["Z&[JPy-te[()g
1T"
60 GTX$(241,300)="H1Ta 1ZEhfZPf[&
pPPfaJPy&pffaJPy%TH%a
T"
70 GTX$(301,333)="%]eTTfUFgP2fVPfW
%VT%WUFP="
80 CX$=""hp*hhVJphhJP%XT%YU)W
-RpI%VQTTHPpfUFWPj"
90 REM A=USR(ADR(GTX$),ADR(B$),LEN(B$)
,X,Y)
100 DIM PNT(6),ANS(6),MIX(6),A$(40),C$
(40),W$(10)
110 MIN=5:MAX=10:TYPE=1:PCNT=6:ROUNDS=
10:BPCT=0:DIF=1:TH=1:HSCR=0:SCORE=0
120 GOTO 810
130 FOR W=15 TO 0 STEP -3:SOUND 0,25*(
X+1),10,W:NEXT W:RETURN
140 A$="ROUND # ":A$(9)=STR$(ROUND)
150 A=USR(GX,ADR(A$),LEN(A$),48,48)
160 A=USR(GX,ADR("COMPLETED"),9,48,56)
170 A$="BONUS = ":A$(9)=STR$(176-Y)
180 SCORE=SCORE+176-Y
190 A=USR(GX,ADR(A$),LEN(A$),48,72)
200 A$="SCORE = ":A$(9)=STR$(SCORE):A=
USR(GX,ADR(A$),LEN(A$),48,84)
210 FOR I=1 TO 50
220 A=240*RND(0):FOR Q=0 TO 15 STEP 5
230 SOUND 0,A,10,Q:SOUND 1,A+5,10,Q:NE
XT Q:NEXT I
240 SOUND 0,0,0,0:SOUND 1,0,0,0:RETURN
250 ON TYPE GOTO 260,270,280
260 B$="■ + ■ + ■ + ■ + ■ +
■ + ■":GOTO 290
270 B$="■ - ■ - ■ - ■ - ■ -
■ - ■":GOTO 290
280 B$="■ x ■ x ■ x ■ x ■ x
■ x ■"
290 FOR I=1 TO 6:MIX(I)=I
300 A=INT(MAX*RND(0))+MIN:IF A>MAX THE
N 300
310 B=INT(MAX*RND(0))+MIN:IF B>MAX THE
N 310
320 IF B>A THEN C=A:A=B:B=C
330 ON TYPE GOTO 340,350,360
340 ANS(I)=A+B:GOTO 370
```

```
350 ANS(I)=A-B:GOTO 370
360 ANS(I)=A*B
370 C=6*(I-1)+2:B$(C,C+1)=STR$(A):B$(C
+3,C+4)=STR$(B)
380 NEXT I
390 FOR I=6 TO 1 STEP -1:PNT(I)=1
400 A=INT(I*RND(0))+1
410 B=MIX(A):MIX(A)=MIX(I):MIX(I)=B:NE
XT I
420 RETURN
430 GRAPHICS 24:POKE 710,0:A=USR(CX,IN
T(255*RND(0)))
440 ON TYPE GOTO 450,460,470
450 A=USR(GX,ADR("+ ADDITION +"),12,11
2,0):GOTO 480
460 A=USR(GX,ADR("- SUBTRACTION -"),15
,96,0):GOTO 480
470 A=USR(GX,ADR("x MULTIPLICATION x")
,18,88,0)
480 FOR J=0 TO 6:FOR I=16 TO 176 STEP
8
490 A=USR(GX,ADR(" "),1,J*48,I)
500 NEXT I:NEXT J
510 RETURN
520 SCORE=SCORE+ANSW:PNT(X+1)=0
530 W$=B$(6*X+1,6*X+7):FOR I=Y TO 16 S
TEP -1
540 SOUND 0,I,10,5:SOUND 0,I+5,10,5
550 A=USR(GX,ADR(W$),7,XX-24,I):COLOR
1:PLOT XX+4,I+8
560 NEXT I
570 W$="=":W$(2)=STR$(ANSW):IF ANSW<10
 THEN W$(LEN(W$)+1)=" "
580 A=USR(GX,ADR(W$),LEN(W$),XX-16,24)
:B$(6*X+2,6*X+6)="     "
590 SOUND 0,0,0,0:SOUND 1,0,0,0
600 COLOR 0:PLOT XX+4,184
610 DRAWTO XX+4,32
620 A=240*RND(0):FOR Q=0 TO 15 STEP 5
630 SOUND 0,A,10,Q:SOUND 1,A+5,10,Q:NE
XT Q
640 SOUND 0,0,0,0:SOUND 1,0,0,0:RETURN
650 X1=X:FOR I=15 TO 0 STEP -0.1:SOUND
 0,256*RND(0),8,I:NEXT I
660 FOR W=1 TO 6:IF PNT(W)=0 THEN 690
670 X=W-1:XX=X*48+24:ANSW=ANS(W)
680 GOSUB 530:SCORE=SCORE-ANSW:TOK=TOK
-1:GOSUB 770
690 NEXT W
700 XX=24+48*X1:X=X1:RETURN
710 A$="  ":A$(3)=STR$(PC):A$(LEN(A$)+
1)="%"
720 A=USR(GX,ADR(A$),LEN(A$),48,48)
730 A=USR(GX,ADR("*REPEAT ROUND*"),14,
48,56)
740 FOR I=15 TO 0 STEP -0.05
750 SOUND 0,15*I,6,I:NEXT I
760 RETURN
770 PC=INT(100*(TOK/6))
780 A=USR(GX,ADR("%"),1,301,128):A$=ST
R$(PC):A$(LEN(A$)+1)=" "
790 FOR I=0 TO LEN(A$)-1:A=USR(GX,ADR(
A$)+I,1,301,136+8*I):NEXT I
800 RETURN
810 GRAPHICS 0:POKE 77,0:REM NEW GAME
820 POKE 710,0:POKE 752,1
830 POSITION 24,0:? "* MATH WIZARD *"
840 ? "SCORE ";SCORE;" HIGH ";HSCR;" T
YPE ";TH
850 POSITION 2,2:? CHR$(17);:FOR I=3 T
O 37:? CHR$(18);:NEXT I:? CHR$(5);
860 POSITION 2,3:? CHR$(124);"USE STIC
K 0 ";CHR$(27);CHR$(31)
870 POSITION 28,3:? CHR$(124);"UP/DN";
CHR$(124);"L/R";CHR$(124);
880 POSITION 2,4:? CHR$(1);:FOR I=3 TO
 37:? CHR$(18);:NEXT I:? CHR$(4);
890 FOR I=5 TO 19:POSITION 2,I:? CHR$(
124);
900 POSITION 28,I:? CHR$(124);:POSITIO
N 34,I:? CHR$(124);
910 POSITION 38,I:? CHR$(124);:NEXT I
920 POSITION 2,20:? CHR$(26);:FOR I=3
TO 37:? CHR$(18);:NEXT I:? CHR$(3);
930 RESTORE
940 FOR I=1 TO 12:READ X,Y,B$:POSITION
 X,Y:? B$;:NEXT I
950 DATA 4,5,Minimum Starting #
960 DATA 4,7,Maximum Starting #
970 DATA 3,9,% Correct to Advance
980 DATA 3,11,Difficulty Increment
990 DATA 6,13,Rounds Per Game
1000 DATA 3,15,Problem Type
1010 DATA 4,17,(1) Addition
1020 DATA 4,18,(2) Subtraction
1030 DATA 4,19,(3) Multiplication
1040 DATA 2,21,Move STICK 0 UP/DOWN to
 Select Item
1050 DATA 2,22,Left-Decrease Right-Inc
rease Value
1060 DATA 2,23,Press FIRE to Begin Gam
e
1070 X=35:Y=5:SEL=1:DELA=50
1080 FOR I=1 TO 6
1090 POSITION X,Y
1100 ON I GOTO 1110,1120,1130,1140,115
0,1160
1110 ? MIN;:GOTO 1170
1120 ? MAX;:GOTO 1170
1130 ? INT(100*PCNT/6);:GOTO 1170
1140 ? DIF;:GOTO 1170
```

continued on page 28


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**MATH WIZARD** continued from page 25

```
1150 ? ROUNDS;:GOTO 1170
1160 ? TYPE;
1170 Y=Y+2:NEXT I
1180 FOR I=1 TO 3:POSITION 4,16+I:? "
";:NEXT I
1190 POSITION 4,16+TYPE:? CHR$(27);CHR
$(31);
1200 POSITION 30,2*SEL+3:? CHR$(148);
1210 A=STICK(0):IF  NOT (STRIG(0)) THE
N 1530
1220 IF A=15 THEN POSITION 30,2*SEL+3:
? CHR$(20);:DELA=50:FOR I=1 TO 15:NEXT
 I:GOTO 1200
1230 IF A=13 THEN B=SEL+1:GOTO 1270
1240 IF A=14 THEN B=SEL-1:GOTO 1270
1250 B=(A=7)-(A=11):IF B<>0 THEN GOTO
1310
1260 GOTO 1210
1270 POSITION 30,2*SEL+3:? " ";:SEL=B:
IF SEL<1 THEN SEL=6
1280 IF SEL>6 THEN SEL=1
1290 FOR I=1 TO 15:NEXT I:DELA=50
1300 FOR W=15 TO 0 STEP -1:SOUND 0,80,
10,W:NEXT W:GOTO 1200
1310 ON SEL GOTO 1320,1350,1380,1410,1
440,1470
1320 MIN=MIN+B:IF MIN<=0 THEN MIN=1
1330 IF MIN>MAX-5 THEN MIN=MAX-5
1340 POSITION X,5:? "  ";:POSITION X,5
:? MIN;:GOTO 1500
1350 MAX=MAX+B:IF MAX>99 THEN MAX=99
1360 IF MAX<MIN+5 THEN MAX=MIN+5
1370 POSITION X,7:? "  ";:POSITION X,7
:? MAX;:GOTO 1500
1380 PCNT=PCNT+B:IF PCNT>6 THEN PCNT=6
1390 IF PCNT<1 THEN PCNT=1
1400 POSITION X,9:? "   ";:POSITION X,
9:? INT(100*PCNT/6);:GOTO 1500
1410 DIF=DIF+B:IF DIF<1 THEN DIF=1
1420 IF DIF>20 THEN DIF=20
1430 POSITION X,11:? "  ";:POSITION X,
11:? DIF;:GOTO 1500
1440 ROUNDS=ROUNDS+B:IF ROUNDS>99 THEN
 ROUNDS=99
1450 IF ROUNDS<1 THEN ROUNDS=1
1460 POSITION X,13:? "  ";:POSITION X,
13:? ROUNDS;:GOTO 1500
1470 FOR I=1 TO 3:POSITION 4,16+I:? "
";:NEXT I:TYPE=TYPE+B:IF TYPE<1 THEN T
YPE=1
1480 IF TYPE>3 THEN TYPE=3
1490 POSITION X,15:? TYPE;:POSITION 4,
16+TYPE:? CHR$(27);CHR$(31);
1500 DELA=DELA-5:IF DELA<1 THEN DELA=1
1510 FOR I=15 TO 0 STEP -5:SOUND 0,60,
10,I:NEXT I
1520 FOR I=1 TO DELA:NEXT I:GOTO 1200
1530 SCORE=0:X=2:XX=120:PCNT=INT(100*P
CNT/6)
1540 ON TYPE GOTO 1550,1560,1570
1550 C$="██+██=":GOTO 1580
1560 C$="██-██=":GOTO 1580
1570 C$="██x██="
1580 FOR ROUND=1 TO ROUNDS
1590 GOSUB 430:GOSUB 250:A$="PROB 1  R
OUND":Y=32
1600 FOR I=0 TO LEN(A$)-1:A=USR(GX,ADR
(A$)+I,1,301,8*I):NEXT I
1610 A$=STR$(ROUND):FOR I=0 TO LEN(A$)
-1:A=USR(GX,ADR(A$)+I,1,301,112+8*I):N
EXT I
1620 TOK=6:GOSUB 770
1630 REM WORK 6 PROBLEMS FOR CURRENT R
OUND
1640 FOR PROB=1 TO 6:A$=STR$(PROB):A=U
SR(GX,ADR(A$),1,301,40)
1650 ANSW=ANS(MIX(PROB)):C$(7)="     ":
C$(7)=STR$(ANSW):C$(LEN(C$)+1)="     "
1660 A=USR(GX,ADR(C$),LEN(C$),112,8)
1670 REM UPDATE POSITION OF PROBLEMS
1680 A=USR(GX,ADR(B$),37,0,Y)
1690 A=USR(GX,ADR("♠"),1,XX,184)
1700 A=STICK(0):IF A=15 THEN 1740
1710 X1=XX:X=X+(A=6 OR A=5 OR A=7)-(A=
10 OR A=11 OR A=9):IF X<0 THEN X=0
1720 IF X>5 THEN X=5
1730 XX=24+48*X:A=USR(GX,ADR(" "),1,X1
,184):A=USR(GX,ADR("♠"),1,XX,184):GOSU
B 130
1740 A=USR(GX,ADR("✚"),1,XX,184):IF ST
RIG(0) THEN 1790
1750 COLOR 1:PLOT XX+4,184:DRAWTO XX+4
,Y+8
1760 IF ANS(X+1)=ANSW AND PNT(X+1)=1 T
HEN GOSUB 520:GOTO 1810
1770 COLOR 0:PLOT XX+4,184:DRAWTO XX+4
,Y+8:TOK=TOK-1:GOSUB 770
1780 FOR I=15 TO 0 STEP -0.2:SOUND 0,2
55*RND(0),8,I:NEXT I
1790 Y=Y+1:IF Y>176 THEN Y=176:GOSUB 6
50:GOTO 1820
1800 GOTO 1680
1810 POKE 77,0:NEXT PROB
1820 GOSUB 770:IF PC<PCNT THEN GOSUB 7
10:GOTO 1590
1830 GOSUB 140:MAX=MAX+DIF:MIN=MIN+INT
(DIF*RND(0)+1)
1840 PC=100:NEXT ROUND
1850 IF SCORE>HSCR THEN HSCR=SCORE:TH=
TYPE
1860 PCNT=6:GOTO 810
```

## TYPO TABLE

Variable checksum = 1124524

| Line num range | | Code | Length |
|---|---|---|---|
| 5 | — 60 | GA | 563 |
| 70 | — 150 | TL | 527 |
| 160 | — 260 | JZ | 525 |
| 270 | — 380 | JK | 428 |
| 390 | — 500 | UC | 506 |
| 510 | — 600 | XW | 508 |
| 610 | — 710 | AE | 523 |
| 720 | — 830 | DN | 483 |
| 840 | — 920 | IB | 578 |
| 930 | — 1040 | YZ | 342 |
| 1050 | — 1160 | BA | 335 |
| 1170 | — 1270 | PG | 525 |
| 1280 | — 1390 | BZ | 489 |
| 1400 | — 1500 | LG | 513 |
| 1510 | — 1620 | ME | 520 |
| 1630 | — 1730 | GF | 601 |
| 1740 | — 1830 | TR | 517 |
| 1840 | — 1860 | VN | 65 |

# LIGHT PEN DOODLE

## Learning by trial and error

by JOHN and MARY HARRISON

The name "light pen" is actually a misnomer. Unlike a miniature flashlight, a light pen does not emit a beam of light. Rather, it is simply a slender rod that contains a phototransistor which responds to the light emitted by a TV or monitor screen. As a result, light pens are most responsive when there is a sharp contrast in brightness between the screen's background and the characters being displayed.

Several manufacturers offer light pens for sale. These range in price from $25 to over $150. And if you're handy with a soldering iron, you can build one from scratch.

### SYNOPSIS

*This drawing program requires BASIC, 16K, and a light pen. Futurehouse of Chapel Hill, NC, and Tech-Sketch of Fairfield, NJ, are two manufacturers of light pens for Atari computers. The program runs on all models of Atari computers. 1200XL owners may have to change the statement:*

*SETCOLOR 4,0,14*

*in line 1010. If you get a distorted display, change the 14 to 8 or 10.*

### EDUCATIONAL USES

Because parents and schools often introduce children to computers at a very early age—sometimes before they can even read or spell—the children often lack the gross motor skills needed to use a joystick or keyboard. But most children are able to point. By using light pens as extensions of their fingers, young children can indicate answers even if they cannot read or spell. Thus, time that would have otherwise been spent laboriously locating numbers or letters on the keyboard can instead be spent thinking about and enjoying a program.

Obviously, the light pen is not appropriate for every program or topic. But it does provide a friendly interface between the user—especially the young user—and the computer.

### ATARI IMPLEMENTATION

The Atari computers use seven memory locations to control the light pen. Location 53277 sets up ("latches") the pen. It must be cleared and reset prior to each reading.

Locations 53264–53267 specify which joystick port is to be used by the pen. Location 53264 indicates that it is plugged into Port 1; location 53267 indicates Port 4. This location also determines if the light pen is in use. (It normally contains a one, but its value is set to zero when the pen is placed close to the screen).

Locations 564 and 565 contain the horizontal and vertical positions of the light pen. These values do not correspond directly to the screen position for any particular graphics mode, but you can still think of the screen as a coordinate plane.

### HORIZONTAL/VERTICAL POSITIONING

The light pen's horizontal position is linked to color clock units. Because TV sets and monitors are subject to overscan, the left-hand edge of the screen is indicated by 76 in the horizontal-position register. As the pen moves across the screen, the value in the horizontal register increases until it reaches 224. The next color clock (to the right) causes the horizontal-position register to be reset to zero. If you continue to move to the right, the screen's right-hand edge will be represented by 16 in the horizontal register.

Vertical position is determined by counting scan lines from the top of the screen to the pen's position. Again, due to overscan, the top of the screen is represented by 16 in the vertical-position register; the bottom is represented by 111. These values are independent of the graphics mode being used, so it's necessary to scale the pen's readings to match the correct screen positions for the

continued on page 32




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**LIGHT PEN DOODLE** continued from page 30

graphics mode in use.

## USING YOUR LIGHT PEN

To get an idea of how a light pen works, plug your pen into joystick Port 1, then type in and run the following program:

```
5 GRAPHICS 0
10 POKE 53277,0:POKE 53277,4
20 PEN=PEEK(53264)
30 IF PEN=1 THEN 10
40 H=PEEK(564):V=PEEK(565)
50 PRINT H,V
60 GOTO 10
```

Line 5 sets up Graphics Mode 0 so that the light pen's positions can be easily displayed. Line 10 prepares the computer for the pen. Line 20 checks to see if the pen has been used. Line 30 sends control back to line 10 if it hasn't been used. Line 40 gets the horizontal and vertical positions from the appropriate memory locations. Line 50 prints these values. Line 60 repeats the process until you press [BREAK].

## VARYING READINGS

As you run this demonstration program, you may notice that successive readings can differ significantly. The degree of variation depends for the most part on the quality of your light pen. If it has an on/off switch, you have more control over the readings. On the other hand, if your pen is the basic, no-frills model (like ours), you must be very careful when you point the pen. Otherwise, you're likely to get a reading from the lamp above your TV screen.

However, even a good light pen may exhibit some degree of scatter in the horizontal position. This position is determined by counting the color clocks. Because an inexpensive pen has fewer parts, it tends to be inaccurate with respect to horizontal positioning on the screen.

There are several ways to compensate for this. First, take several readings. Then average them to determine the horizontal position, or select the middle reading, *or* select the most common value. You can also take successive pairs of readings until the two readings fall within a given tolerance. (Fortunately, vertical readings do not normally exhibit similar discrepancies.)

## LIGHT PEN DOODLE

Light Pen Doodle is a short program that demonstrates some of the capabilities of even an inexpensive light pen. When you run the program, a white screen divided into a picture area and a color-selection area is displayed. The color-selection portion contains five rectangles. The four rectangles on the left are used to select colors; the fifth one erases the screen. This program is written in Graphics Mode 7, which restricts us to the use of four colors.

Since our light pen does not have an on/off switch, we use the keyboard to turn it on and off. Each time a key is pressed, the value in location 764 changes. A value of 255 in this location indicates that a key has *not* been pressed. Pressing the space bar changes the value in location 764, and thus activates or deactivates the pen.

This feature works as follows. First, select a color by pointing to one of the rectangles in the color-selection area. Then point the pen at the picture area and press the space bar to turn the pen on. To change colors, point the pen away from the picture area and press the space bar to turn it off. Select a new color, and then repeat the process.

## TAKE-APART

Light Pen Doodle is shown in Listing 1. Its major segments are explained below:

Lines 10–120: This subroutine determines the horizontal and vertical positions of the light pen. These positions are then corrected for the TV overscan and returned in variables H and V. It isn't necessary to perform any additional scaling for Graphics Mode 7.

Lines 200–250: This subroutine determines which color is used. Color selection is determined by the horizontal position of the pen. If the clear-screen selection is made, a flag is set to one.

Lines 1000–1180: This is the initialization portion of the main program. It selects Graphics Mode 7, sets up the color registers, and displays the picture and color-selection areas.

Lines 1190–1310: This is the main program loop used to doodle. It selects colors, turns the pen on and off, and displays points in the picture area. Frequent subroutine calls are made to the routines at lines 10 and 200.

## CONCLUSION

This completes our quick demonstration of how a simple light pen works. We've found that there is currently a lack of information about the techniques needed to interface a light pen with an Atari computer; a certain amount of trial and error will probably be required to make your pen work in a particular application. A major part of the problem is that most of the inexpensive light pens on the market today were designed as input devices for multiple-choice selection, rather than as high-resolution-graphics tools. But recent advances in light pen technology should soon change this situation for the better.

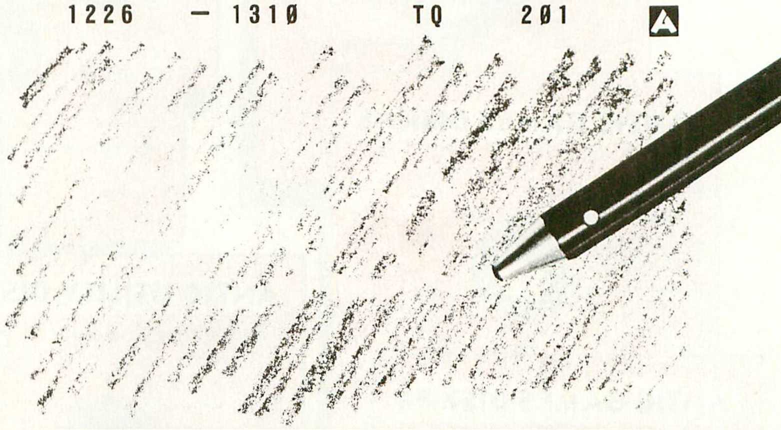
*John and Mary Harrison are parents, teachers and Atari hobbyists. Mary teaches math and computer science at the high school level. John holds an M.S. in computer science and develops educational software. They coordinate the Education Department for ANTIC.*

```
5 REM LIGHT PEN DOODLE
6 REM BY JOHN AND MARY HARRISON
7 REM ANTIC MAGAZINE APRIL 1984
9 GOTO 1000
10 POKE 53277,0:POKE 53277,4
20 PENOFF=PEEK(53264)
30 IF PENOFF=1 THEN GOTO 10
40 H1=PEEK(564):H2=PEEK(564)
50 IF H1<H2-1 OR H1>H2+1 THEN 40
60 IF H1<76 AND H1>16 THEN 40
70 H=H1
80 IF H<17 THEN H=225+H
90 H=H-76:IF H>159 THEN H=159
100 V=PEEK(565)-16:IF V>95 THEN V=95
110 IF V<0 THEN V=0
120 RETURN
200 IF H<35 THEN COLOR 1:GOTO 250
210 IF H<65 THEN COLOR 2:GOTO 250
220 IF H<95 THEN COLOR 3:GOTO 250
230 IF H<125 THEN COLOR 4:GOTO 250
240 FLAG=1
250 RETURN
1000 GRAPHICS 7+16
1010 SETCOLOR 0,3,6:SETCOLOR 1,7,6:SET
COLOR 4,0,14:SETCOLOR 2,12,6
1030 COLOR 1
1031 PLOT 0,0:DRAWTO 159,0:DRAWTO 159,
85:DRAWTO 0,85:DRAWTO 0,0
1040 FOR I=1 TO 5
1050 COL=1
1055 IF I<=3 THEN COL=I
1056 COLOR COL
1060 PLOT I*30-5,95
1070 DRAWTO I*30-5,90
1080 DRAWTO 10+(I-1)*30,90
1090 IF I>3 THEN 1140
1100 POSITION 10+(I-1)*30,95
1110 POKE 765,I
1120 XIO 18,#6,0,0,"S:"
1130 GOTO 1160
1140 DRAWTO 10+(I-1)*30,95
1150 DRAWTO I*30-5,95
1160 NEXT I
1170 PLOT 135,95:DRAWTO 140,90
1180 PLOT 135,90:DRAWTO 140,95
1190 POKE 764,255:IF PEEK(764)<>255 TH
EN 1190
1200 GOSUB 10
1210 IF V<85 THEN 1200
1220 GOSUB 200
1225 IF PEEK(764)=255 THEN 1225
1226 POKE 764,255
1230 IF FLAG=1 THEN FLAG=0:GOTO 1000
1240 GOSUB 10
1250 IF V>85 THEN V=85
1270 PLOT H,V
1280 IF PEEK(764)<>255 THEN 1190
1290 GOSUB 10
1295 IF V>85 THEN V=85
1300 DRAWTO H,V
1310 GOTO 1280
```

**TYPO TABLE**

Variable checksum = 144195

| Line num range | Code | Length |
|---|---|---|
| 5 — 80 | FE | 320 |
| 90 — 1010 | IX | 413 |
| 1030 — 1110 | RR | 354 |
| 1120 — 1225 | LY | 344 |
| 1226 — 1310 | TQ | 201 |



# PUBLIC DOMAIN SOFTWARE

**ANTIC GAMES DISK #1**

1. Chicken: a great game from ANTIC V.1, No.1
2. Hangman: the traditional word game
3. Creation: a version of Life
4. Reverse: order of string numbers
5. Monopoly: computerized!
6. Lunar lander: select terrain (stick)
7. Zonex: hidden color patters in grid
8. Clewso: detective adventure, graphics

**ANTIC GAMES DISK #2**

1. Speed Demon: from ANTIC V.1, No.4
2. Guy' Grid Game
3. Deathstar: from ANTIC V.1, No.2
4. Blackjack: Vegas rules
5. Civil War: a strategic simulation
6. Artillery: firing strategy game
7. Super Wumpus: text adventure

**ANTIC GAMES DISK #3**

1. Petals
2. Showdown
3. FROG: from ANTIC V.1, No.3
4. Draw: Guy Hurt
5. Plus Zero
6. Collisi, and more

**ANTIC GAMES DISK #4**

1. Vultures: from Stan Ockers
2. Castle Hexagon: also by Stan Ockers
3. Adventure: The remainder of the disk contains an adventure game program which you can play, or you can use the program to write your own adventure. Instructions included in program.

**ANTIC GAMES DISK #5**

1. Bats: who else? Stan Ockers, from ANTIC V.1, No.5
2. Stellar Defense: from ANTIC V.1, No.6, slightly improved
3. Yahtzee
4. Mastermind
5. Hamurabi: the classic simulation
6. Slalom: become a master schusser
7. Couch: analyze yourself
8. Aceyducy & more

**ANTIC GRAPHICS DEMO #1**

1. Spider: from ANTIC V.1, No.3
2. Rainbow
3. Horses
4. ATARI logo
5. Oxygen
6. Spiral
7. Pretty
8. Message and more

**ANTIC PHOTO GRAPHICS**

Digitized Photos

**ANTIC UTILITY DISK #1**

1. Doc: program allows you to accompany programs with separate documentation on disk.
2. Microassembler: allows you to create USR routines-assembler, more
3. Assembler-Editor: BASIC, slow but versatile
4. Num: automatic line numbering utility in BASIC
5. Memtest: runs without BASIC cartridge, to test all memory
6. Color: 128 colors at once
7. Printnop: connect parallel printer from jacks 3 & 4

**ANTIC UTILITY DISK #2**

1. Bubble Sort: From ANTIC V.1, No.4
2. Typo: from ANTIC V.1, No.3
3. Home inventory
4. KEY 6: Cipher coding
5. Renumber
6. Compare: listings for differences
7. SUPER: menu
8. Modem
9. RT clock & more

**ANTIC UTILITY DISK #3**

1. Disassembler: from ANTIC V.2, No.1
2. Tiny Text: from ANTIC V.1, No.6
3. GTIA text window: from ANTIC V.2, No.1
4. Label: disk label on Epson
5. Set up printer: sets up MX80 for Visicalc
6. Keyboard: tutorial & more

**ANTIC GR. & SO. DEMO #1**

1. Graphic
2. Draw
3. Rainbow
4. Tune Rite
5. Etch Sketch
6. Baby Pro Sound and more

**ANTIC MUSIC DISK #1**

Requires Music Composer Cartridge

1. Prelude
2. Joplin
3. In My Life
4. Star Trek
5. Daisy
6. Greensleeves
7. Yellow Submarine, and many more

**Antic** is pleased to offer a library of Public Domain Software for the Atari computers currently comprised of 12 disks. These programs are not yet available on cassettes. These disks contain unprotected material from the libraries of Atari users' groups from around the country.

The potential buyer should note that these programs are sold *as is*. Their usefulness may depend on your experience with the computer. They may contain programming quirks that require some modification. However, all perform reasonably well. Contents of the disks may vary slightly from the published description due to unforseen circumstances, but each disk is filled to reasonable capacity with useful programs of the kind described. In most cases, there is no documentation except that in the program themselves. An excellent value at $10.00 each, plus $1.50 per order for shipping/handling. Send check or money order (payable to ANTIC Publishing), and disk number(s) to:

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ANTIC presents these programs in diskette form for the convenience of the Atari community, in the belief that all of the programs offered are in the Public Domain and that no proprietary interests or rights to these programs are claimed by anyone. These diskettes are not copyprotected, nor does ANTIC claim rights to the programs themselves. The price of the diskettes is based on the cost of making them available.

# SAFE SPACE AND LARGE LETTERS

## Logo's Antics

by KEN HARMS

The secrets of Atari's Logo finally are beginning to emerge! This month we'll discuss two places where you can store your machine-language code and a method that allows you to use Logo to print large letters on the screen. We'll even be able to move turtles around on a text screen! (By the way, both of these topics were covered in direct response to readers' requests — so if you want it, ask for it!)

**SYNOPSIS**

*This article explains where to locate machine-language programs when using the Logo programming language, and how to create text displays with large letters. The program requires the Logo cartridge from Atari, and runs on all Atari computers.*

### ABOUT LOGO

First of all, Logo is not an "applications" language. That is, it was designed to serve as an environment for experimentation, rather than as a language for writing polished, arcade-style game programs. It doesn't offer sophisticated error-trapping capabilities, or easy access to the Atari's own special capabilities. Atari did take special pains to produce an improved Logo that is highly compatible with Apple Logo. That's the good news. The bad news is that — as a result — we Atari users often have to deal with the Apple's poor design as we travel in Logo's world. Wouldn't you love to have access to the Atari's full-screen editor in Logo?

Logo's memory is divided into two sections, one below the graphics screen and one above it, because Apple does it that way. As in all Logos, this memory, called "nodespace," is made up of five-byte units called nodes. This space is used to store your program and to execute its procedures. To find its way around nodespace, Logo sets up a series of "pointers" that tell it where things are. Generally, pointers are two bytes long, and are stored low byte first, then high byte. (A byte is a character or a numerical value.)

### FINDING A SAFE SPACE

Now we're ready to consider the best way to store machine-language programs. But, just to make things more interesting, note that nodespace pointers are only one-byte long — the "high" byte. The pointer at 14268 directs us to the start of the first bank of nodespace, or the bottom of memory. To get this decimal address, type:

```
PR 256 * .EXAMINE 14268
```

Let's call this address STARTONE. ENDONE, the end of the first bank, is pointed to by the high-byte at 14271. The two pointers for the second bank are STARTTWO at 14269 and ENDTWO at 14270.

Just as in BASIC, the best hiding place for machine code is an area of memory that the language processor has "forgotten." So, just move up the bottom of memory by .DEPOSITing a new value in 14268. Logo only stores page addresses (a "page" is 256 bytes), so if you add one to the value in STARTONE, memory moves 256 bytes. But — since nodespace is made up of 5-byte nodes and five doesn't divide into 256 evenly — it soon becomes apparent that we have to move the bottom of memory in increments of five pages each — or a whopping 1280 bytes! By the way, the folks at LCSI have warned that memory should be moved only when Logo is first booted.

If you don't need 1280 bytes and aren't planning to create your own turtle shapes, a good storage area is the shape table, which is ordinarily used to store the shapes you create with the shape editor. This table has 256 bytes and starts at 13824. You can probably use the SETSH command sequence to install the code without a series of .DEPOSITs.

### PUTTING LARGE LETTERS ON THE SCREEN

Atari computers use several processors. The one we think of as "the computer" is a 6502 microprocessor. The Atari

continued on next page

uses another processor to handle the screen display so that the 6502 can work as efficiently as possible. This is the main reason that the Atari 800XL is more "powerful" than the Apple IIe; Atari's special processor frees the 6502 to make calculations more efficiently than the Apple can.

## A PROCESSOR CALLED ANTIC

This special processor is called ANTIC, or the ANTIC chip. ANTIC is actually a tiny computer. It needs a special program, called a display list, to tell it how to display the data that the 6502 processor puts into memory. Each of the different display modes is simply a different program for ANTIC. So we can produce large letters by providing ANTIC with a large-character display program. The one I've chosen is known in BASIC as Graphics 2. Under Logo, it displays 12 lines of 20 characters in four colors.

## BUILDING A SPECIAL DISPLAY LIST

Using the listing as our road map, let's build a special display list for Logo. Chris Mitchell, a computer hobbyist, musician and colleague of mine who lives in Seattle, came up with the idea of using the screen buffer as a text screen. This allows us to display both the turtle and text at the same time! As a result, you can use a specially-shaped turtle as a pointer to highlight words or make the regular turtle dance around the title of your program. (Unfortunately, however, if you try to draw with the turtle either your drawing will not appear, or it will display weird characters. Sorry about that!)

To set up, we first call a Full Screen, followed by a Hide Turtle (leave this out if you want the turtle to appear on the screen) and a Clear Screen. The last step ensures that we won't display an old drawing.

ANTIC looks for a display list (its program) at the memory address pointed to by the two-byte pointer at 560 and 561. The second line takes those values and uses them to start building a new display list. Generally, the first three values in the list are 112's, which tell ANTIC to display blank lines (these allow for TV pictures that aren't quite right). The next instruction, a 71, tells ANTIC that we're going to display Graphics 2 characters.

The next two values, 17 and 59, make up a two-byte pointer to the data that ANTIC will display. At this point, things get a bit tricky. Logo uses a two-byte pointer at 14272 and 14273 to find the start of the screen buffer that we use for our data. The buffer is 960 bytes long. But we're using only 240 bytes (12 lines of 20 bytes). As a result, if we start at the beginning of the buffer we'll encounter 36 blank lines before seeing anything on the screen. Because of this, we simply skip 720 bytes to the 240 bytes we need. If you're using a 64K system, use 209 and 66 instead of 17 and 59.

The next 11 pieces of data in the list are sevens. These tell ANTIC to "display this line as large letters." Next, we send ANTIC a 65 to tell it that we're finished. Finally, ANTIC needs the address of the next program, or display list. In this case, we simply use the values for the same display list, since we want ANTIC to jump back to the beginning and do it again.

## FINAL THOUGHTS

I hope that at this point you'll be off and running with these special displays for your Logo programs. Further information on display lists can be found in a series of articles in ANTIC by Allan Moose and Marian Lorenz (Display Lists Simplified, page 33, February/March 1983; Start Interrupting, page 24, June 1983; More Interrupting, page 54, December 1983). If there's enough interest, I'll cover procedures for other special displays in future columns. By the way, when you exit these special modes, use a TS (text screen) and a CT (clear text) to get everything back to normal.

*Ken Harms, our Contributing Editor for the Logo/PILOT department, is Vice President of Administration for the California Division of the American Cancer Society.*

```
TO MODE2
FS HT CS
MAKE "START ( ( ( .EXAMINE 561 ) * 256
 ) + .EXAMINE 560 )
REPEAT 3 [.DEPOSIT :START 112 MAKE "ST
ART ( :START + 1 )]
.DEPOSIT :START 71 MAKE "START ( :STAR
T + 1 )
.DEPOSIT :START 17 MAKE "START ( :STAR
T + 1 )
.DEPOSIT :START 59 MAKE "START ( :STAR
T + 1 )
REPEAT 11 [.DEPOSIT :START 7 MAKE "STA
RT ( :START + 1 )]
.DEPOSIT :START 65 MAKE "START ( :STAR
T + 1 )
.DEPOSIT :START ( .EXAMINE 560 ) MAKE
"START ( :START + 1 )
.DEPOSIT :START ( .EXAMINE 561 )
END
```

# JOHN VICTOR, COMPUTER EDUCATOR

by CHRISTOPHER RAUBER
Assistant Editor

*Education has been a major factor in the life of John Victor and in the life of the company he founded in 1978, Program Design, Inc. (PDI). A graduate of Michigan State University, where he earned a B.S. degree in psychology, Victor did graduate work in educational psychology at Michigan State and worked toward an MBA at City University of New York.*

*He began his career as a designer of programmed instructional materials at Resources Development in East Lansing, Michigan. Then, in 1967, he moved to New York City to work as an editor and consultant for Grolier Educational Corp., a major publisher of reference books and encyclopaedias.*

*Victor has also developed courseware for the American Mananagement Association, the National Pest Control Association, and the U.S. Army. He has written a book that explains how to take the SAT (published by the Associated Press) and numerous articles on computer-related subjects.*

*In 1976, Victor formed a company to publish computer-education products. Two years later, the company was incorporated as Program Design, Inc. PDI was the first educational software producer in the home computer field, and has a number of firsts in that field. Its product line of more than 40 titles consists of four types of home computer software: preschool games and interactive storybooks, computer tutorials and courseware, educational games, and arcade games.*



John Victor, president and CEO of Program Design, Inc.

*The following interview with John Victor, president and CEO of PDI, was conducted at the Winter Consumer Electronics Show (CES) in Las Vegas, Nevada, on January 7, 1984, by ANTIC Assistant Editor Christopher Rauber.*

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# HOW TO TURN ON YOUR ATARI




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**ANTIC:** What products of interest to Atari computer owners will your company introduce here at the CES?

**VICTOR:** Basically, we are winding up a series of products we started a few years ago — the Interactive Story Books. These are programs with human voices that teach certain concepts to preschool and younger school children. The top end of this series is a product called **Robin's Halloween** that teaches words by sight recognition. Robin is a little girl who encounters some creatures from outer space. As the child listens and watches, he or she has to pick words to help Robin move from one part of the story to another.

We have another product called **Penny's Balloon** that is also a reading/writing program. Those complete our Interactive Story Book line. We also have some other products here, including a program called **Picture Blocks**, which is a computerized jigsaw puzzle, and **Giant's Tooth**, a logic program that puts objects into categories.

But we're shifting the focus of our products right now from education/entertainment to more serious, content-oriented educational products. We're coming out with a French course for the Atari, and one on algebra, and we're working on the **Montana Reading Program** . . .

The industry, at this point, seems to be in transition. We're shifting from the hobbyists to mass consumers. These groups have different needs and different ideas about what constitutes good educational software. We're trying to appeal to the mass consumers. We think they are less familiar with the computer, less likely to be impressed by graphics, more likely to be impressed with content.

**A:** What is the focus of your company, and how have you evolved over the last five years?

**V:** Good question. This is our transition year. We started this business in 1978 with very definite ideas about what constituted good educational products. Unfortunately, I think we were overly influenced by what other people were doing in the industry. They were interested in show biz and gimmicks, and we got ourselves tied up in that too much. We didn't forget our initial ideas, but we got caught up with games and show biz, and lost sight of what good educational software really should be doing. This year we're going back to serious education, particularly because we think that's what the mass market wants, and those are the people we want to sell.

**A:** How would **Clipper Around the Horn** fit in with this? Is it part of the transition phase?

**V:** No, that's part of our show-biz phase. Although it is a good intellectual game, it really isn't a mass consumer item like the Montana Reading Program, or our tutorial on how to program. Those are more serious educational programs.

**A:** So you're moving towards the hard-core educational market?

**V:** Right, but for the home consumer.

**A:** You recently completed a survey on computer-assisted teaching for preschool children. Do you have any comments on the results of that research?

**V:** Yes. We think it was unusual and valuable, because people in this industry do very little research to see what the effects of software are. They may test it to see if it holds interest or operates correctly, but they never test to see what the software produces.

Our survey indicated some surprising things. First, we found that most "preschool" software is really designed for eight-year-olds. We found that the level the industry thinks a typical four-year-old is at is nowhere near the actual level. The second thing we found out was that our preschool products were very effective at teaching, and not for the reasons that the industry usually believes. We found that kids were less interested in graphics, and more interested in being able to control whatever it is that's on the screen.

That's an important discovery for us, but unfortunately you've got to be able to sell it to adults, and adults don't necessarily like crude graphics. Kids don't seem to care one way or the other, but they like the idea of having something they can control on the screen. We believe that a lot more research has to be done by the industry on its products. And that includes games. I really don't think the game developers understand the man-machine relationship. They know what the computer does, but they aren't quite up on the relationship between the person and the machine. That goes for all kinds of software.

**A:** Why is computer-assisted education more effective than traditional methods, and how can parents help this process along?

**V:** There are five elements that have to be there for learning to take place. First, the learner must interact with the material to be learned. People seldom interact in the classroom. They sit and get stuff laid on them. With the computer, you interact. Second, you need feedback on how well, or poorly, you are doing. With a textbook, you don't get any feedback; in class, you get some. But a computer is an excellent feedback mechanism. Third is motivation. There has to be a reason to do the learning. Sometimes it's enough just to learn, to be right. Sometimes you need a little extra. Traditional education seems to be very negative; it's what you do wrong that is noticed. Computer programs don't do that nearly as much as traditional classroom teachers. Fourth, the subject matter needs to be presented with continuity. You learn one thing and build on that. Computers don't guarantee con-

continued on next page

tinuity, but they facilitate it. Finally, control. The more the learner controls the learning situation, the stronger the learning.

**A:** It seems that educational software tends to the extremes of being too game oriented or too deadly serious. Do you think you can find a happy medium in your new products?

**V:** There is a meeting point, and I don't know where it is. However, if you test your software, you can discover what it takes to keep people's interest. The industry assumes that certain things will be interesting to kids that really aren't. Kids will work on drill and practice and not be as bored as adults think they will be. Very young children have a high tolerance for repetition. They'll drive you crazy, listening to the same thing over and over and over. Young kids love repetition. And you've got to direct your software to the end user. If a three-year-old wants repetition, put it in. Don't design preschool products for adults.

**A:** That ties in with the distinction between education and learning that was made recently by James Morgan, chairman of Atari. He said that "education is something that is done to you; learning is something you do for yourself."

**V:** If a learner feels that something's being done to him or her, it destroys the learning process. Learning is physiological. There are chemical changes taking place in the brain. If the learner isn't ready to learn, learning isn't going to take place. And the best way to make sure that the learner is ready to learn is to put the learner in control. In traditional education, the learner is rarely in control. Children are forced to learn when they're not ready to learn.

What is learning? It is the ability of an organism to do something after going through an experience (for example, a program) that it couldn't do before the experience. If you want to evaluate the effect of a program, you find out what the student can do after using the program that he couldn't do before.

**A:** What specific skills are your programs designed to teach, and which ones can you measure after the program has been used?

**V:** Okay, let's talk about preschoolers, on whom we just did this study. Our preschool program teaches basic cognitive skills related to reading readiness. Now, what is that? It includes the ability to look at two pictures and see if they are the same or different; to see four objects and pick the one that doesn't belong with the others; to recognize letters of the alphabet — not necessarily by name — but to distinguish them from other marks and from each other. We might include some shape and sound recognition. These are the skills that tests of reading readiness usually measure, and these are the ones that we develop. That's how we accomplished the 48 percent improvement rate for our kids on the standardized tests.

**A:** Let's move from software to the area of your company's growth. In 1983, PDI reported a 40 percent increase in sales over 1982. How do sales look for 1984, especially in the Atari segment of your market?

**V:** Our 1983 figures were affected by Atari's problems, and its failure to get the new computers to the market as expected, but we think 1984 is going to be much better. I think we can experience a 100 percent growth in sales this year.

**A:** What do you see as the growth rate for educational programs in general over the next few years?

**V:** Atari is a very strong educational machine. The mass merchandisers report that 20 percent of all the software they sell is educational. That's a big increase in educational software sales over previous years. For Atari, I think the educational opportunities are extremely good. It's an affordable machine with superior capabilities. A lot of publishers see it as a panacea, especially those whose game market is softening. They think educational software is going to bail them out. It may not, but we're going to see a lot of action around the Atari.

**A:** Tell us about your product development program. How do you decide what products you're going to make?

**V:** We ask our distributors what kind of products the consumers are asking for. We look at these interests to see if we can devise a legitimate educational package within the price range that the distributors want. Sometimes it's ridiculous — they want a course on how to use your computer and they want to sell it for $14.95. There's no way a software publisher could make money on such a product. But, given the realities of the restrictions on software development, that's the way we do it.

**A:** How do you get your software authors?

**V:** Every way you can imagine. It's a problem for us, because developing educational software is a particular kind of skill. We have some very good outside authors, but in the future I think we're going to try to get teams of writers and educational designers and programmers together, and to do it that way. It's too hard to get programmer/educators, as we have done in the past.

**A:** You've been in the educational field for some 20 years. How has that experience affected PDI and its products?

**V:** My experience dates back to the 1960's when I worked on developing programmed instruction. A lot of what we learned then is totally unknown to the people designing computerized educational products today. I don't know why, but they're just not familiar with the research and products that came out in the 1960's. I'm trying to bring that experience to bear on the products we're designing at PDI today.

There's a quote going around that applies to the whole software industry: "Never have so many based so much on so little." It's amazing how

much stuff people have said about education, and how little evidence they have to back it up.

For example, Logo. It's reported to be a fantastic educational programming language. Who says? The people who developed Logo never did any research to back that up. I have never seen a single study showing that Logo is a better teaching language than BASIC. But they sold the industry on it. I can't figure out how or why that ever came about. They should have had to demonstrate that the language had the qualities attributed to it.

**A:** Do you see any solution to this problem of a lack of research?

**V:** Yeah, do research!

**A:** Do you think the developers should do the research?

**V:** Sure. Seymour Papert could have done it for Logo. Take two classrooms. One gets Logo, one gets BASIC. Six months later, test them. Find out which group developed the best programming skills, the best style — if that's the point he was trying to make. There were lots of things that could have been evaluated. But they just gave Logo to a bunch of kids, and after a while they asked them how they liked it. "Gee, it's terrific!" That's not scientific. I wouldn't have accepted that conclusion. Still, Logo is used in a lot of schools. They have a big base on which to draw research information, and they're just not doing it.

**A:** Does PDI plan to do research in the future?

**V:** Yes. And we're going with tested and developed stuff. The Montana Reading Program was fully tested at the University of Montana. It was compared to the best traditional reading methods. The kids in the computerized Montana program did 22 percent better — pre-test to post-test — than the ones who used the traditional method.

**A:** Adequate documentation is a problem in the industry in general and the home market in particular. What is PDI doing to make sure that documentation is comprehensive and understandable enough for the home user?

**V:** Here's a controversial statement: "The best documentation is no documentation." Nobody reads it. A product should be self-documenting. I'll give you an example. I use **Letter Perfect** as a word processor. Why? Because I don't have to read the book. I can sit right down and start word processing. All its features are built-in Atari features. I tried that with the first Atari Word Processor (not **AtariWriter**) and after five minutes I chucked it. I didn't want to read that giant manual, and nothing was natural. I think that 90 percent of the people who use software react like I did. Business software is different; you have to have well-developed documentation. But games should be self-documenting.

**A:** So you're going to move away from documentation?

**V:** Oh, we'll have documentation; the reviewers pan you if you don't. But if you can't use a product without reading the documentation, I don't think it's a good product.

**A:** Do you have any comments on the issue of protecting software from infringement?

**V:** Tough issue. My guess is that the mass market consumer is the least likely software thief. I don't think our company needs to worry too much about that. The computer hobbyist is also much maligned; oh, there are some who are just out-and-out thieves, but in the Atari market it's not a major concern. I think the major problem is what I call "institutional piracy."

Schools are the worst. Schools are such pirates that they have eliminated themselves as appropriate markets for educational software. How do you combat it? I don't think disk protection gives you a whole hell of a lot. Any scheme yet devised can be broken. But there are ways to market products that are tough to steal. We make kits. It's tough to steal a kit. You have to copy disks, cassettes, books, etc. It gets to be so much trouble that you might as well buy it.

## We think 1984 is going to be much better than 1983. I think we can expect a 100 percent growth in sales this year.

**A:** What do you think makes PDI unique? What do you offer that other companies don't?

**V:** For one thing, we were the first in our area, and we've been imitated. This industry loves to play follow the leader. Whether many people know us or not, there are certainly many development houses that have copied the kinds of things we do. We did the Interactive Story Book, the sound-and-picture presentation that follows a story line. We did the first SAT preparation program. We did the first "How to Program" tutorial, and we haven't been copied on that; it's a very hard thing to imitate and do well.

But, in general, we've been the first, and then other people have come in . . . We have been innovators, and other people have copied us.

**A:** Any special characteristics that your programs have that you would like to talk about?

**V:** The most important thing with us is human interaction and learning. We have tied our future to Atari in a big way. We've made a big commitment there, and as Atari goes, so we go.

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# GAMES

by DAVID DUBERMAN Technical Editor

It's well known that Atari computers are unparalleled as game machines. During the first few years that the 400 and 800 were available, however, good game software was relatively scarce. Today, that situation has changed significantly. Hundreds of games are available, and more are introduced all the time. For the benefit of our newer readers, we present this selection of some of our favorite Atari games, old and new. Our primary criteria in selecting these games were quality and enduring interest. The initial thrill of playing some games wears off all too quickly, but these are games you can return to again and again. (See end of article for manufacturer information.)

JOUST




In **Joust**'s, ***Atari, Inc.***, fantasy scenario, you ride a giant flying ostrich and carry a lance. Your primary task is to unseat wave upon wave of enemy buzzard riders, but you'll also meet several nasty pterodactyls along the way. Joust is unique in several respects. You maneuver by flapping your wings, and you don't shoot your opponents, you bump into them. Joust also features a simultaneous two-player mode in which cooperative and competitive play alternate. This game is so addictive that it ought to be outlawed.

BLUE MAX



Climb into your World War I biplane, and assume the role of Max Chatsworth of the R.A.F. Employing a three-dimensional, diagonally-scrolling playfield, **Blue Max**, ***Synapse Software***, recreates a bombing and strafing run by a fighter-bomber more realistically than you may have thought possible on a home computer. Its graphics and gameplay put its forerunner, Zaxxon, to shame. Gamesters everywhere await designer Bob Polin's next creation with bated breath.

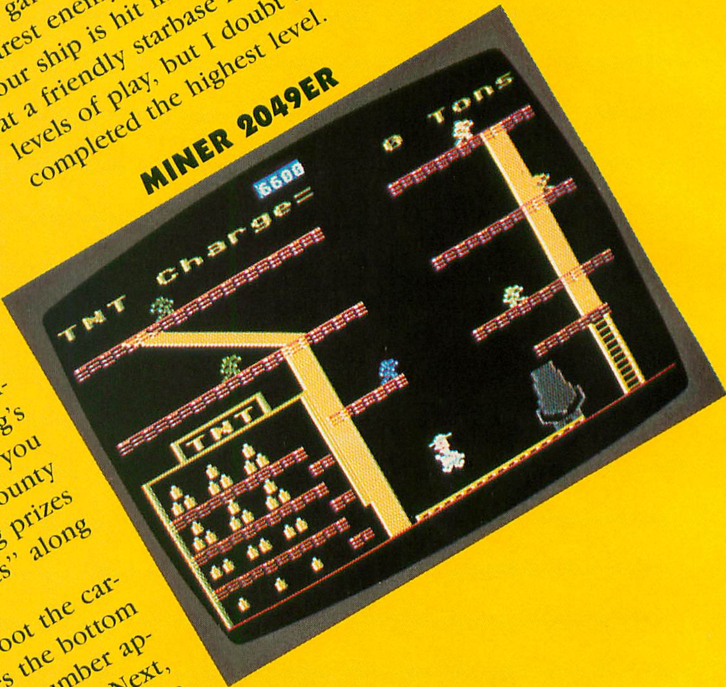
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## STAR RAIDERS



Released by Atari in 1979 (at the same time as its first computers), **Star Raiders, *Atari, Inc.***, is still one of the greatest space-war games available for any microcomputer. You zoom through a startlingly realistic 3-D starfield as you defend your beleaguered starbases against the marauding Zylons. After you eliminate all enemy ships from a given sector of space, check your galactic chart for the location of the nearest enemy, then hyperwarp to that sector. If your ship is hit in battle, you may have to dock at a friendly starbase for repairs. There are four levels of play, but I doubt that anyone has ever completed the highest level.

## MINER 2049ER




It all started with Donkey Kong, but computerists generally agree that **Miner 2049er, *Big Five Software***, is the superior climbing contest. Miner offers ten screens to Donkey Kong's three. To get from one screen to the next, you must maneuver your on-screen persona, Bounty Bob, through various levels, collecting prizes and avoiding or neutralizing "mutants" along the way.

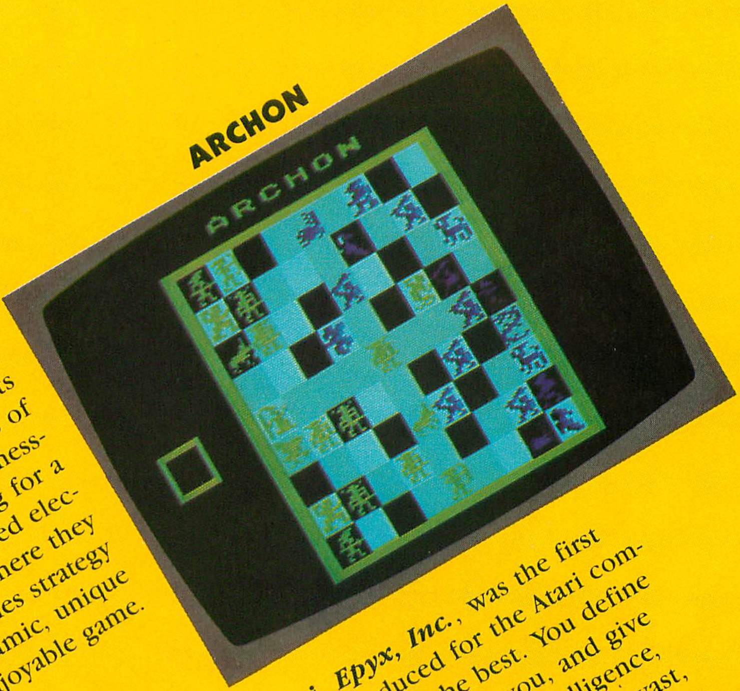
To "skip" to any level you wish, boot the cartridge, and wait until "Bob" reaches the bottom of the screen and Big Five's phone number appears. Write it down, then start the game. Next, jump onto the first level, and type in the phone number. Finally, press [SHIFT] and the number of the level at which you wish to play.

## ODESTA CHESS 7.0



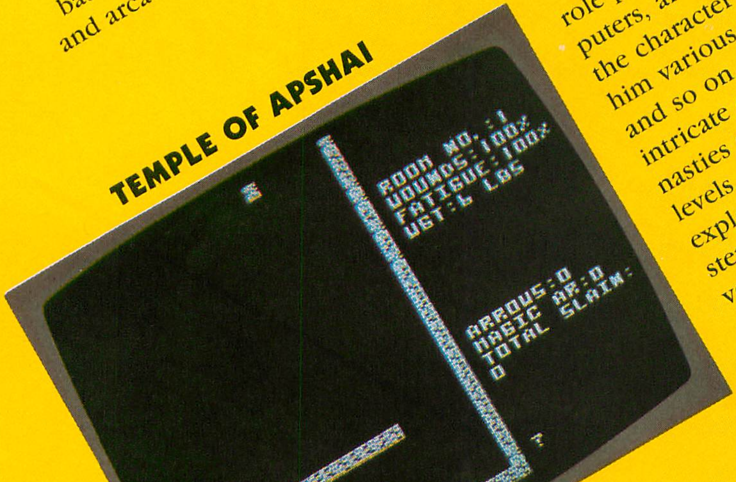

**Chess 7.0, *Odesta Corporation***, is the definitive computerized version of the classic board game. Seventeen levels of play are available, including "Perpetual" (the computer plays at its best at this level, but takes practically forever to move), and "Matefinder" (which can be used to solve complex mating problems). The game's features and special functions are far too extensive to list here. But if you like chess, Chess 7.0 is the only chess program you'll ever need.

## ARCHON




**Archon, *Electronic Arts***, is arguably the best board game ever created for the home computer. The game pits the forces of light against the forces of darkness on a square checkerboard in a chess-like scenario. However, when vying for a square the two combatants are whisked electronically to a separate battlefield, where they battle to the death. Archon combines strategy and arcade-quality action in a dynamic, unique and utterly enjoyable game.

## TEMPLE OF APSHAI




**Temple of Apshai, *Epyx, Inc.***, was the first role-playing game introduced for the Atari computers, and it's still one of the best. You define the character who will play for you, and give him various degrees of strength, intelligence, and so on. You then venture forth into a vast, intricate dungeon replete with all sorts of nasties and goodies. The dungeon contains four levels, each with 56 or more rooms, so you can explore it for months without retracing your steps. Epyx has recently introduced a cartridge version of the game called Gateway to Apshai. Gateway is easier to play, since all functions are controlled with the joystick and the console keys, but it's just as much fun.

## CHOPLIFTER



**Choplifter by *Broderbund***, the helicopter rescue game, is widely recognized as a home-computer classic. You must fly your chopper into enemy territory and land to pick up hostages. When the hostages have boarded, you take off and fly them back to safety. Each time you set forth on a new sortie, enemy tanks and jets attack you more furiously, so fast reflexes are a must. You can fire at your enemies, but it's more effective to outmaneuver them. The game contains violence, but the main emphasis is on saving lives rather than ending them. This positive theme, combined with superior graphics and gameplay, makes it an ideal family arcade game.

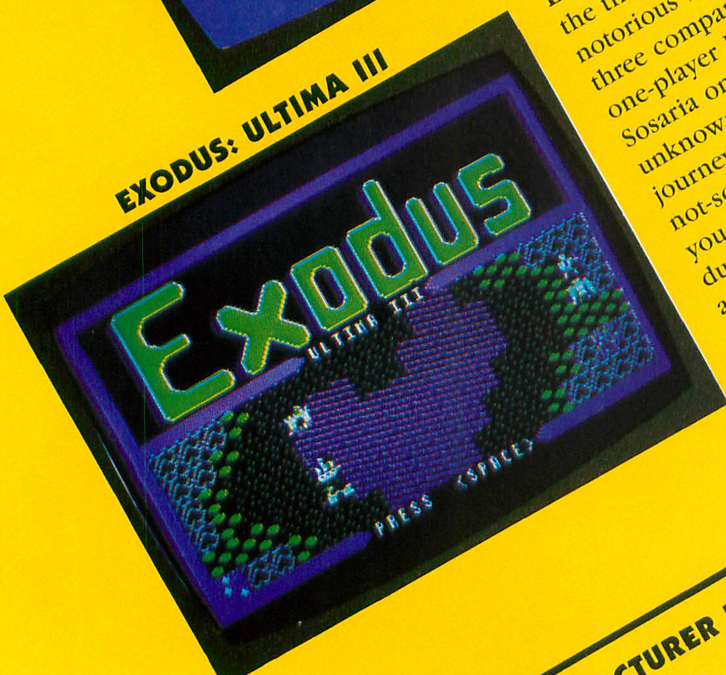
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## ZORK




**Zork, *Infocom, Inc.***, was the first in an illustrious line of text adventures from Infocom. Many aficionados of the genre claim that it's still the best. The adventure begins in front of a seemingly innocuous white house, but your explorations soon lead you into a vast underground universe that is faintly reminiscent of Alice's Wonderland. Chief among Zork's special qualities is a never-ending sense of wonder and discovery. Threats and opportunities surround your search. Playing this game is a unique adventure.

## EXODUS: ULTIMA III




**Exodus: Ultima III, *Origin Systems, Inc.***, is the third in a series of epic adventures by the notorious Lord British. Accompanied by up to three companions (a departure from previous one-player Ultimas), you traverse the legendary Sosaria on a quest to discover and vanquish the unknown evil that scourges the land. On your journey, you'll meet all sorts of friendly and not-so-friendly characters. Your quest will take you over land and sea, and through perilous dungeons. Exodus combines the Atari's graphics and sound with solid programming expertise. The result is a game you'll return to often.

## MANUFACTURER INFORMATION

Origin Systems Inc.
1545 Osgood #7
North Andover, MA 01845
(617) 681-0609

Synapse Software
5221 Central Ave. #200
Richmond, CA 94804
(415) 527-7751

Big Five Software
14640 Keswick St.
Van Nuys, CA 91405
(213) 782-6861

Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415) 571-7171

Epyx, Inc.
1043 Kiel Court
Sunnyvale, CA 94089
(408) 745-0700

Atari, Inc.
P.O. Box 427
Sunnyvale, CA 94086
(408) 745-2000

Odesta Corp.
3186 Doolittle Dr.
Northbrook, IL 60062
(312) 498-5615

Infocom, Inc.
55 Wheeler St.
Cambridge, MA 02138
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# CREATIVE PROGRAMMING WITH PLAYER/MISSILE GRAPHICS

## A simple way to add color

by PHILIP SEYER

Most of us have seen games that use Player/Missile graphics (PMG). This sophisticated graphics system, built into all Atari computers, allows you to create and animate small figures, and to move them across the screen without disturbing the background.

However, PMG have useful applications other than games. For instance, there are many data-processing programs that use only the text screen of Graphics 0. You can spice up such a program with color very easily using PMG. The following program listing shows you how to accomplish this without resorting to the use of display-list interrupts or other fancy techniques.

### SYNOPSIS

*This article explains how to use Player/Missile graphics in non-standard ways. The accompanying program runs on all Atari computers. 16K RAM and BASIC are required.*

### PROGRAM DESCRIPTION

Line 5 turns off the cursor. To turn it back on, POKE 752,0. Line 7 passes control to a subroutine that starts at line 500. Line 500 POKEs a number into memory location 623, which is known as GPRIOR, or the priority-selection register. Priority, in PMG parlance, refers to which image appears (has priority) when two or more images occupy the same area of the screen. By POKEing a one into GPRIOR, we tell the Atari to display all players in front of all playfields. A "player" is a graphic image created with PMG; "playfield" refers to a screen image created by means other than PMG.

GPRIOR also enables us to combine four missiles, or two-bit-wide players, into a fifth player. We accomplish this by adding 16 to the number POKEd into GPRIOR.

### QUADRUPLE WIDTH

Line 505 sets all players to quadruple width (32 bits) by POKEing each player-width register with three. We use quadruple width to highlight a large area of the screen. Line 507 does the same thing with the missiles.

Lines 510 through 518 set all players to the same color. By doing this and positioning the players side by side, we can cover the entire screen with what appears to be a single giant player.

Line 560 makes player 0 (the first player) into a solid column that runs the height of the screen by POKEing location 53261 with 255. Binary for 255 is 11111111, so the player appears to be a solid bar. Experiment with this

effect by POKEing different numbers into location 53261. This is the only way you can define an entire player with one byte. For instance, POKE 53261,129 to create a player that looks like two vertical stripes. Lines 570 through 582 do the same thing for the other players.

That's all there is to this simplified PMG setup. Note that you don't have to worry about things like Player/Missile data structure, or where to reserve memory for the data. When you want to simply add color to a text or graphics screen, this simple system is probably the best.

## MULTICOLORED PLAYERS

Line 292 shows you how to use GPRIOR (location 623) to create multicolored players. To implement this, POKE 623,PEEK(623)+32. Now, when you overlap two players, a third color appears in the area of overlap. This is how arcade-game designers create multicolored players.

*The program that accompanies this article is reprinted from Philip Seyer's* Atari Player Missile Graphics, *Reston Publishing Co. (1984), Reston, VA, (703) 437-8900. Philip Seyer writes on educational topics, and is currently working full-time on Atari books and programs.*

```
1 REM GRAPHICS 0 P/M
2 REM BY PHILIP C. SEYER
3 REM ANTIC MAGAZINE APRIL 1984
4 ? CHR$(125):REM CLEAR SCREEN
5 POKE 752,1:REM TURN OFF CURSOR
7 GOSUB 500:REM SIMPLIFIED PMG SETUP
10 POSITION 2,10:? "In this example,"
20 ? "we are NOT using"
25 ? "the ANTIC chip or"
30 ? "Direct Memory Access"
32 ? "to fetch Players "
33 ? "or Missiles."
35 GOSUB 900:REM Wait for user to press a key.
36 ? CHR$(125):REM CLEAR SCREEN
40 POSITION 24,9:? "Notice how easy"
42 POSITION 24,10:? "it is to add "
44 POSITION 24,11:? "Color to "
46 POSITION 24,12:? "Graphics Mode 0."
50 DELAY=300:GOSUB 700:REM PAUSE FOR A MOMENT
60 POSITION 24,16:? "Like this!":DELAY=50:GOSUB 700
62 POKE 53248,176:POKE 53249,144:REM PUT PLAYERS ON SCREEN
65 DELAY=100:GOSUB 700
70 POSITION 24,18:? "It's also easy"
80 POSITION 24,19:? "to change that"
81 POSITION 24,20:? "color.":DELAY=200:GOSUB 700
85 FOR I=0 TO 254 STEP 10:X=5^3:POKE 704,I:POKE 705,I:NEXT I:REM X=5^3 is added here simply to add a pause
90 POKE 704,80:POKE 705,80
100 GOSUB 700
102 ? CHR$(125):POSITION 2,3
105 ? "And it's easy to"
106 ? "go back to the regular"
107 ? "playfield color."
108 GOSUB 900
110 POKE 53248,0:POKE 53249,0:REM MOVE PLAYERS OFF SCREEN
115 GOSUB 700
117 ? CHR$(125):? :? :POSITION 2,3
120 ? "You can also fill"
125 ? "the entire screen"
130 ? "with all 5 players."
135 DELAY=400:GOSUB 700
140 ? :? "Like so:":X=X^3
150 GOSUB 1000:REM MOVE ALL 5 PLAYERS ONTO SCREEN
230 GOSUB 700:? CHR$(125):POSITION 2,3
232 ? "The playfield is now hiding"
234 ? "behind the players.":? :?
235 DELAY=250:GOSUB 700
236 ? "Now I'll put it in front"
238 ? "of the players."
239 DELAY=100:GOSUB 700:POKE 623,4+16
240 DELAY=500:GOSUB 700:? CHR$(125):POSITION 2,10:? "Next, when you press a key,"
241 ? "I'll shrink the playfield"
242 ? "for a moment by poking ":? "Location 559 with 33."
243 GOSUB 900:? CHR$(125):POKE 559,1+32:DELAY=200:GOSUB 700:POKE 559,2+32
244 ? :? :? "Next, let's set each player"
245 ? "to a different color."
246 GOSUB 900:POKE 559,2+32
247 POKE 704,16:POKE 705,64:POKE 706,96:POKE 707,144:POKE 711,192:REM SET PLAYERS TO DIFFERENT COLORS
248 ? CHR$(125):GOSUB 700
250 POSITION 2,3:? "Notice that players "
252 ? "0-3 are behind the playfield"
254 ? "but Player 4 (at right)"
255 ? "is in front of the playfield."
260 GOSUB 900
265 ? CHR$(125):POKE 623,4+16:REM SET PRIORITIES AND ENABLE 5TH PLAYER
270 POSITION 2,3:? "As you can see, Player 4"
272 ? "(the one made up of missiles)"
274 ? "always displays in front of"
276 ? "all playfields.":GOSUB 900:? CHR$(125):POSITION 2,3
277 ? "Let's get rid of the ":? "playfield again.":GOSUB 900:? CHR$(125):POKE 623,1+16:POSITION 2,9
278 ? "  Playfield now hiding.":GOSUB 900
280 ? CHR$(125):POKE 623,4+16:POSITION 2,3
```

continued on next page

```
282 ? "In conclusion, here's an"
283 ? "example of how you can"
284 ? "overlap players to create"
286 ? "a multicolored object."
290 GOSUB 900:? CHR$(125)
292 POKE 623,1+16+32:REM SET PRIORITY,
ENABLE 5TH PLAYER, CREATE MULTICOLORED
 OBJECT WHEN PLAYERS OVERLAP
299 REM SET PLAYERS 0 AND 1 TO OVERLAP
300 POKE 53248,48:REM PLAYER 0
310 POKE 53249,48+16:REM OVERLAP
320 POKE 53250,0:REM MOVE OFF SCREEN
350 POKE 53251,0
360 POKE 53252,0
370 POKE 53253,0
380 POKE 53254,0
390 POKE 53255,0
400 POSITION 18,10:? "The three colors
"
410 POSITION 18,11:? "at left were "
420 POSITION 18,12:? "produced by"
425 POSITION 18,13:? "Players 0 & 1."
430 POSITION 18,15:? "You can use the"
432 POSITION 18,16:? "same idea to"
434 POSITION 18,17:? "make a multi-"
436 POSITION 18,18:? "colored flying"
438 POSITION 18,19:? "spacecraft!"
440 POSITION 18,22:? "END OF PROGRAM"
499 GOTO 499
500 POKE 623,1+16:REM DISPLAY PLAYERS
IN FRONT OF PLAYFIELD, ENABLE 5TH PLAY
ER
505 POKE 53256,3:POKE 53257,3:POKE 532
58,3:POKE 53259,3:REM SET ALL PLAYERS
TO QUADRUPLE WIDTH
507 POKE 53260,192+48+12+3:REM SET ALL
 MISSILES TO QUARUPLE WIDTH
510 POKE 704,80:REM SET PLAYER 0 COLOR
512 POKE 705,80:REM PLAYER 1 COLOR
514 POKE 706,80:REM PLAYER 2 COLOR
516 POKE 707,80:REM PLAYER 3 COLOR
518 POKE 711,80:REM PLAYER 4 COLOR
559 REM  POKE DATA DIRECTLY INTO THE T
HE PLAYER GRAPHIC REGISTERS
560 POKE 53261,255:REM IMAGE FOR PLAYE
R0
570 POKE 53262,255:REM PLAYER1
575 POKE 53263,255:REM PLAYER 2
580 POKE 53264,255:REM PLAYER 3
582 POKE 53265,255:REM PLAYER 4!
699 RETURN
700 FOR I=1 TO DELAY:NEXT I
710 RETURN
800 IF PEEK(764)<>255 THEN POKE 764,25
5:RETURN
810 GOTO 800
900 POSITION 2,22:? "TAP ANY KEY":? "T
O CONTINUE":GOSUB 800
910 POSITION 2,21:? "                 ":?
"       "
920 RETURN
999 REM MOVE ALL PLAYERS ON SCREEN
1000 POKE 53248,48:REM HOR. POS. P0
1010 POKE 53249,48+32
1020 POKE 53250,48+2*32
1030 POKE 53251,48+3*32
1040 POKE 53252,48+4*32
1050 POKE 53253,48+(4*32)+8
1060 POKE 53254,48+(4*32)+16
1070 POKE 53255,48+(4*32)+24
1080 RETURN
```

## TYPO TABLE

Variable checksum = 78267

| Line num range | | Code | Length |
|---|---|---|---|
| 1 | — 33 | UH | 345 |
| 35 | — 80 | LH | 505 |
| 81 | — 117 | EK | 472 |
| 120 | — 238 | AB | 373 |
| 239 | — 247 | QQ | 565 |
| 248 | — 277 | KV | 573 |
| 278 | — 320 | LX | 518 |
| 350 | — 434 | PN | 381 |
| 436 | — 514 | NG | 530 |
| 516 | — 800 | XX | 386 |
| 810 | — 1060 | AO | 439 |
| 1070 | — 1080 | VO | 53 |



# MATCHBOX TIC-TAC-TOE

## An introduction to artificial intelligence

by JOSEPH HAFNER

This program is an experiment in artificial intelligence. It's designed to simulate learning, the mysterious process of discovering the correct and incorrect responses to a given situation. It will teach your Atari computer to play the ancient and noble game of tic-tac-toe. Your Atari will improve as it plays, until it will seem to be unbeatable. And believe me, it's an uncanny experience to watch your computer get better at the game with practice—it's almost as if the machine were developing a personality of its own.

### SYNOPSIS

*This program serves as an introduction to the fundamentals of artificial intelligence. The program requires 16K for cassette and 24K with a disk system, and runs on all Atari computers.*

### MENACING ORIGINS

This program is based on original research performed in 1960 by an English biologist named Donald Michie. Michie used 300 matchboxes and beads of nine different colors to build his Matchbox Educable Naughts and Crosses Engine (MENACE). Each of the matchboxes had a unique tic-tac-toe pattern on its cover. Each colored bead represented one of the nine possible moves, or squares, in the tic-tac-toe grid. (As you know, in toe there are a number of different legal moves that can be made in any given situation—and *some* moves are better than others.)

At the start of the experiment, he placed an equal number of colored

continued on next page

beads for each legal move into each matchbox. Because beads were removed from the matchboxes as the game progressed, more beads of each color were available for early moves than for later ones. When it was the matchboxes' turn to "play," Michie would locate the matchbox whose pattern matched the existing game board. He would then shake the box and remove a colored bead. This procedure was intended to result in a random choice.

## "TEACHING" A MATCHBOX

The color of the selected bead indicated what move the matchboxes "wanted" to make. The beads selected by this process were then saved until the end of the game. At that point, one of three things would happen. If the matchboxes had won the game, three beads of a chosen bead's color would be added to each matchbox from which a bead had been taken. If Michie won, the saved beads were permanently removed from their matchboxes. This "punished" the matchboxes for making bad moves. If a game ended in a draw, all beads were returned to their original places. In this way, MENACE tended to punish or cancel bad moves and to strongly reinforce good moves.

## A COMPUTER VERSION

In Listing 1, the matchboxes in Michie's experiment are represented by the string MCHBOX$. Each "matchbox" takes up 19 bytes of the string.

The first nine bytes are used to store possible tic-tac-toe patterns. The next nine bytes store counters that represent MENACE's colored beads. The last byte represents the chosen bead (by means of an index that points to the chosen counter).

The game board itself is stored in the BOARD$ string. Actually, eight boards are stored here. This was done because almost all of the board patterns have a number of mirror images. These are identical to the original pattern, except that the board is "rotated" into different positions (or mirror images). If mirror imaging were not taken into account, over 4500 possible patterns would have to be stored by the program, and the game's playing time would be prohibitively long. The ALT array shows how the game boards are rotated to accommodate the mirror-image representations.)

## LEAVE IT TO THE COMPUTER

If you examine my program carefully, you'll notice that some of the 300 possible tic-tac-toe patterns are missing. Instead of including all possible patterns in the program, I decided to let the computer determine if a pattern is a new one. When it comes across a new pattern, it stores it in the MCHBOX$ array. The machine actually "learns" to recognize new patterns when they are presented. This part of the program is handled in lines 1250 through 1460. Let's examine these lines more closely.

## LOOKING AT THE LEARNING CODE

Line 1250 checks to see if a move is the last move of the game; in this case, only one move is possible. This move is found in lines 1260 and 1270.

Line 1280 starts the search to find a matchbox that corresponds to the current board pattern. If a match is found, a jump to line 1380 is made, and the process of randomly choosing a move begins. Otherwise, a new pattern is added to the MCHBOX$ string by lines 1330 through 1370. Since the new pattern must match the board, we move directly to the random-move selection code in lines 1380 through 1410.

This is the point at which I discovered a most interesting phenomenon. I beat the computer 32 times in a row, which left the poor machine without any counters in a certain pattern. Therefore, during the 33rd game it could not find a move other than zero, which is not allowed. So I added line 1420 to the program. This does what any self-respecting learning machine would do in a similar situation—it resets the program and starts over. When I tested this feature, I beat the machine 55 times in a row before it discovered the proper moves and finally won.

In line 1430, we save the computer's chosen move in the 19th position (byte) of the matchbox. Then we reverse the mirroring of the board (so we're looking at it right-side-up) and get back into the game itself at line 1110.

The rest of the program supports these few lines of code, and prompts the human player to make his or her choices. Lines 1480 through 1620 check for a win, loss or draw, and return a number in WIN to indicate what was found. This logic is used only after a move has been made. When the game is over, we end up at line 590, which can then send us on to a number of places, depending on who won the game. Line 760 adds two new "beads" to the matchbox when the computer wins. Line 860 takes away one bead if the computer loses. Line 630 doesn't change a thing.

## HOW TO PLAY

To play this game, use either a joystick plugged into controller jack 1 or the [SELECT] and [START] keys. Either the joystick or the [SELECT] key will move the cursor on the game board to a new position.

When the cursor is in the square you want, press either the fire button or the [START] key and your choice will be recorded. ("X" always goes first.)

When it's your turn, you can see what's in the MCHBOX$ array by pressing the [OPTION] key. It can be listed either to your printer or to the screen (if your printer is turned off). You can also save the patterns stored in the computer by pressing the [OPTION] key before a new game has started. This period is indicated by the "Who goes first?" message. In this case, you'll be asked for a device and file specification (without beginning or ending quotes). When the patterns have been saved, respond normally to the prompt message at the top of the screen.

## GETTING THE MOST FROM THE PROGRAM

To get the most from this program, you should keep statistics. Make a chart of who wins and loses each game in sequence, and plot the results. You'll be able to see your computer improve with practice.

Don't try every conceivable combination on the machine at the outset. The learning process will proceed slowly; there is too much for the computer to "learn" all at once. I prefer to use one or two patterns consistently until the machine has figured out how to handle them. Only then do I move on to a new pattern. Using this technique, the effects of practice on the computer's ability ought to be obvious after 20 games or so. And let the computer go first. It seems to learn much faster that way.

Finally, remember that this is an experimental program. If you don't like the way the computer is learning, restart the program and try again. You can also change the reward and punishment values in lines 760 and 860, to see if the machine learns faster under a different set of conditions. Or you can alter the random-selection weighting factor to provide for greater differentiation between beads of different colors. These parameters are set in line 310.

This program can teach you (and your computer) quite a bit about artificial intelligence. Have fun, experiment, and then sit back and let your Atari amaze your friends and relatives with its new-found skills.

*Joseph Hafner is an electronics design engineer with ten years of hardware and software experience on both large and small computers. He has also taught hardware and software design to beginners, using BASIC, FORTRAN and Assembler.*

```
11Ø DIM MARK$(2),MB$(3ØØ*19),LINE$(5),
BOARD$(72),FNAME$(15),J$(3)
12Ø DIM WIN$(24),INDEX(8),ALT$(72),PLA
YS(4)
13Ø MARK$=CHR$(ASC("X")+32):MARK$(2)=C
HR$(ASC("O")+32)
14Ø MB$(1)="[graphics character]":MB$(57ØØ)="[graphics character]":MB$(2)=MB
$
15Ø MB$(1,9)="         ":FOR I=1Ø TO 1
9:MB$(I)="[graphics character]":NEXT I
16Ø LINE$="[graphics characters]"
18Ø WIN$="[graphics characters]"
2ØØ FOR I=Ø TO 8:READ A:INDEX(I)=A:NEX
T I
21Ø DATA 1,2,3,8,9,4,7,6,5
225 ALT$="[graphics characters]"
27Ø FOR I=Ø TO 4:READ A:PLAYS(I)=A:NEX
T I
28Ø DATA 96,184,175,272,254
29Ø XL=8:XH=XL+4:YL=3:YH=YL+4
3ØØ WINS=Ø:LOSES=Ø:DRAWS=Ø
31Ø R=2:P=1:D=Ø:WFACTOR=1
36Ø GOSUB 2Ø1Ø
38Ø GRAPHICS 2:POKE 756,226:SETCOLOR Ø
,Ø,Ø
39Ø BOARD$(1)=" ":BOARD$(72)=" ":BOARD
$(2)=BOARD$(1):GOSUB 93Ø
4ØØ MOVENUM=Ø:HUMAN=Ø
41Ø ? "WINS=";WINS;" LOSES=";LOSES;" D
RAWS=";DRAWS;
42Ø ? " PATTERNS=";LEN(MB$)/19
43Ø POSITION 2,Ø:? #6;"do you want to
go"
44Ø FOR I=Ø TO 1 STEP Ø:POSITION 5,1:?
 #6;"first[graphics character]yn[graphics character]  "
45Ø FOR J=Ø TO 1 STEP Ø:IF PEEK(53279)
=3 THEN GOSUB 211Ø
46Ø IF PEEK(764)<255 THEN J=2
47Ø NEXT J
48Ø OPEN #2,4,Ø,"K:":GET #2,A:POSITION
 14,1:PUT #6,A+32:CLOSE #2
49Ø IF A=ASC("Y") THEN HUMAN=1:CMPTR=2
:I=2
5ØØ IF A=ASC("N") THEN CMPTR=1:HUMAN=2
:I=2
51Ø NEXT I
52Ø PLAYER=2
53Ø FOR I=Ø TO 19:FOR J=Ø TO 1:POSITIO
N I,J:? #6;" ":NEXT J:NEXT I
54Ø PLAYER=PLAYER+1-2*(PLAYER=2):MOVEN
UM=MOVENUM+1
55Ø POSITION 6,Ø
56Ø IF PLAYER=HUMAN THEN ? #6;"your mo
ve":GOSUB 1Ø1Ø
57Ø IF PLAYER=CMPTR THEN ? #6;" my mov
e ":GOSUB 125Ø
58Ø GOSUB 148Ø
59Ø ON WIN GOTO 54Ø,61Ø,7ØØ,72Ø
61Ø POSITION 6,Ø:? #6;" a draw "
62Ø FOR I=19 TO LEN(MB$) STEP 19:J=ASC
(MB$(I)):MB$(I,I)=CHR$(Ø)
63Ø IF J THEN J=I-1Ø+J:A=ASC(MB$(J)):A
=A+D*(A<255):MB$(J,J)=CHR$(A)
64Ø NEXT I
65Ø DRAWS=DRAWS+1:RESTORE 68Ø
66Ø FOR I=1 TO 1Ø:READ A,B:SOUND Ø,A,1
Ø,8
67Ø FOR J=1 TO B*2Ø:NEXT J:SOUND Ø,Ø,Ø
,Ø:NEXT I:GOTO 38Ø
68Ø DATA 4Ø,1,Ø,1,53,1,53,1,47,2,53,1,
Ø,2,42,1,Ø,1,4Ø,1
7ØØ ON HUMAN GOTO 84Ø,74Ø
72Ø ON CMPTR GOTO 84Ø,74Ø
74Ø POSITION 6,Ø:? #6;" i win "
75Ø FOR I=19 TO LEN(MB$) STEP 19:J=ASC
(MB$(I)):MB$(I,I)=CHR$(Ø)
76Ø IF J THEN J=I-1Ø+J:A=ASC(MB$(J)):A
=A+R*(A<15Ø):MB$(J,J)=CHR$(A)
77Ø NEXT I
78Ø WINS=WINS+1:RESTORE 81Ø
79Ø FOR I=1 TO 19:READ A,B:SOUND Ø,A,1
Ø,8
8ØØ FOR J=1 TO B*2Ø:NEXT J:SOUND Ø,Ø,Ø
,Ø:NEXT I:GOTO 38Ø
81Ø DATA 81,1,81,1,81,1,81,2,162,3,162
,1,144,1,121,1,81,3,81,1,76,1
82Ø DATA 81,1,81,2,91,2,81,2,91,2,1Ø8,
1,1Ø2,1,136,5
84Ø POSITION 6,Ø:? #6;" you win "
85Ø FOR I=19 TO LEN(MB$) STEP 19:J=ASC
(MB$(I)):MB$(I,I)=CHR$(Ø)
```

continued on next page

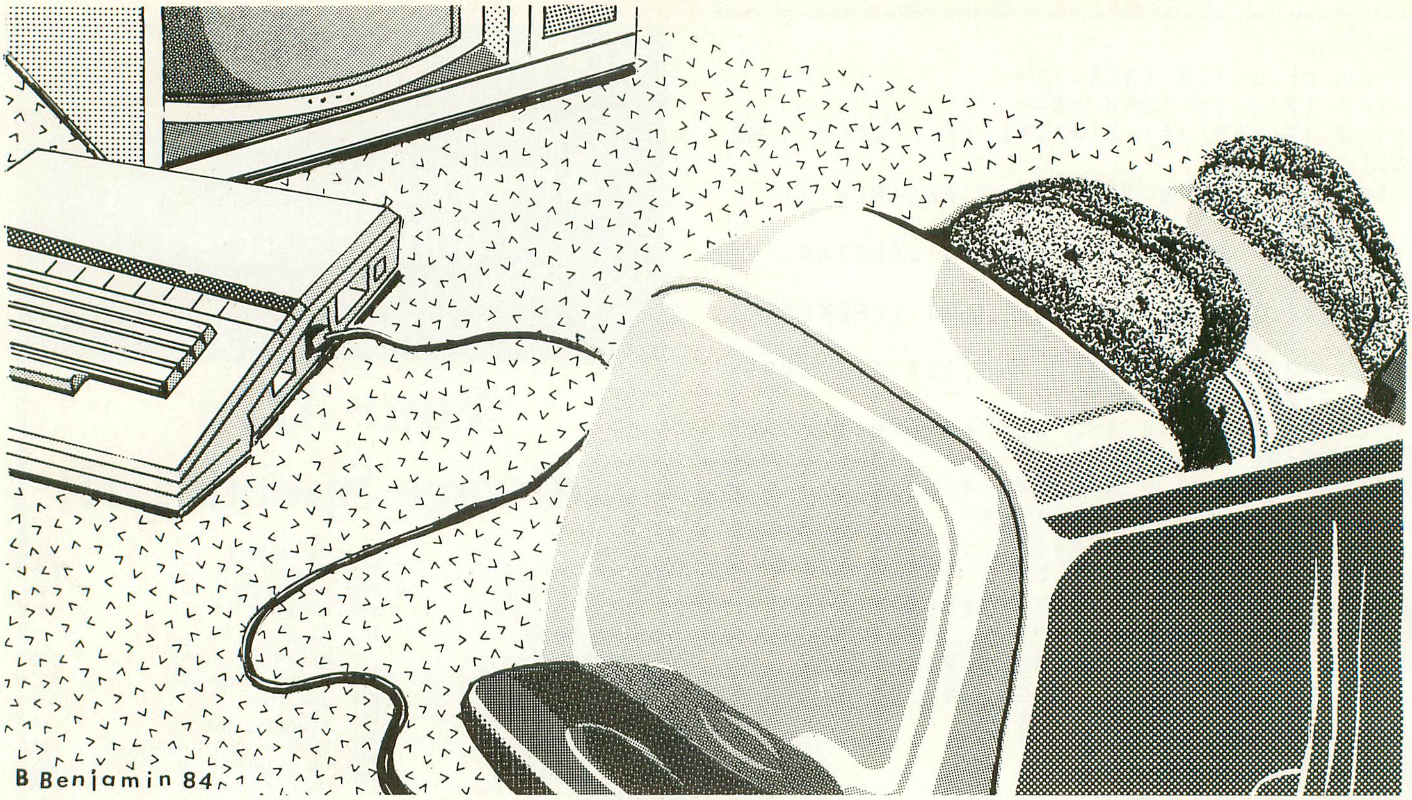
```
86Ø IF J THEN J=I-1Ø+J:A=ASC(MB$(J)):A
=A-P*(A>Ø):MB$(J,J)=CHR$(A)
87Ø NEXT I
88Ø LOSES=LOSES+1:RESTORE 91Ø
89Ø FOR I=1 TO 11:READ A,B:SOUND Ø,A,1
Ø,8
9ØØ FOR J=1 TO B*2Ø:NEXT J:SOUND Ø,Ø,Ø
,Ø:NEXT I:GOTO 38Ø
91Ø DATA 193,4,193,3,193,1,193,3,162,3
,173,1,173,3,193,1,193,3,2Ø4,1,193,5
93Ø POSITION XL,YL+Ø:? #6;BOARD$(1,1);
"|";BOARD$(2,2);"|";BOARD$(3,3)
94Ø POSITION XL,YL+1:? #6;LINE$
95Ø POSITION XL,YL+2:? #6;BOARD$(8,8);
"|";BOARD$(9,9);"|";BOARD$(4,4)
96Ø POSITION XL,YL+3:? #6;LINE$
97Ø POSITION XL,YL+4:? #6;BOARD$(7,7);
"|";BOARD$(6,6);"|";BOARD$(5,5)
98Ø FOR I=1ØØ TO 1Ø STEP -5:SOUND Ø,I,
1Ø,8:NEXT I:SOUND Ø,Ø,Ø,Ø
99Ø RETURN
1Ø1Ø CX=XL:CY=YL:BLANK=32:MARKER=2Ø
1Ø2Ø LOCATE CX,CY,A:IF A=BLANK THEN GO
TO 1Ø6Ø
1Ø3Ø CX=CX+2:IF CX>XH THEN CX=XL:CY=CY
+2
1Ø4Ø IF CY>YH THEN CY=YL:CX=XL
1Ø5Ø GOTO 1Ø2Ø
1Ø6Ø POSITION CX,CY:PUT #6,MARKER:GOSU
B 117Ø
1Ø7Ø POSITION CX,CY:PUT #6,BLANK
1Ø8Ø ON KEYIN GOTO 1Ø9Ø,1Ø3Ø,11ØØ
1Ø9Ø GOSUB 117Ø:ON KEYIN GOTO 1Ø6Ø,1Ø3
Ø,11ØØ
11ØØ MOVE=INDEX(3*((CY-YL)/2)+(CX-XL)/
2)
111Ø BOARD$(MOVE,MOVE)=MARK$(PLAYER,PL
AYER)
112Ø GOSUB 93Ø
113Ø FOR I=Ø TO 63 STEP 9:J=ASC(ALT$(I
+MOVE))
114Ø BOARD$(I+J,I+J)=MARK$(PLAYER,PLAY
ER):NEXT I
115Ø RETURN
117Ø IF (PEEK(53279)<>7) THEN FOR J=1
TO 2Ø:NEXT J
118Ø IF (STRIG(Ø)=Ø) OR (STICK(Ø)<>15)
 THEN FOR J=1 TO 2Ø:NEXT J
119Ø FOR I=1 TO 1Ø
12ØØ IF (PEEK(53279)=5) OR (STICK(Ø)<>
15) THEN KEYIN=2:POP :RETURN
121Ø IF (PEEK(53279)=6) OR (STRIG(Ø)<>
1) THEN KEYIN=3:POP :RETURN
122Ø IF (PEEK(53279)=3) THEN GOSUB 171
Ø
123Ø NEXT I:KEYIN=1:RETURN
125Ø IF MOVENUM<>9 THEN GOTO 128Ø
126Ø FOR I=1 TO 9:IF BOARD$(I,I)=" " T
HEN MOVE=I
127Ø NEXT I:GOTO 111Ø
128Ø FOR I=1 TO LEN(MB$)-1Ø STEP 19:I1
=I:I2=I1+8
129Ø FOR J=1 TO 64 STEP 9:J1=J:J2=J1+8
13ØØ IF BOARD$(J1,J2)=MB$(I1,I2) THEN
POP :POP :GOTO 138Ø
131Ø NEXT J
132Ø NEXT I
133Ø I=LEN(MB$)+1:MB$(I)=BOARD$(1,19):
? "  NEW PATTERN"
134Ø FOR J=1 TO 9:K=I+J+8:MB$(K,K)=CHR
$(Ø)
135Ø IF BOARD$(J,J)=" " THEN MB$(K,K)=
CHR$(5-INT((MOVENUM+1)/2))
136Ø NEXT J
137Ø MB$(I+18,I+18)=CHR$(Ø):J1=1:J2=9
138Ø INDEX=I+9:MAXWEIGHT=Ø:MOVE=Ø
139Ø FOR I=INDEX TO INDEX+8:WEIGHT=ASC
(MB$(I))*WFACTOR*RND(Ø)
14ØØ IF WEIGHT>MAXWEIGHT THEN MAXWEIGH
T=WEIGHT:MOVE=I-INDEX+1
141Ø NEXT I
142Ø IF MOVE=Ø THEN ? "   PATTERN RESET
":I=INDEX-9:GOTO 134Ø
143Ø MB$(INDEX+9,INDEX+9)=CHR$(MOVE)
144Ø FOR J=J1 TO J2:IF MOVE=ASC(ALT$(J
)) THEN MOVE=ASC(ALT$(J-J1+1)):J=J2
145Ø NEXT J
146Ø GOTO 111Ø
148Ø PLAY=Ø:WIN=1
149Ø FOR I=1 TO 22 STEP 3
15ØØ SUM=ASC(BOARD$(ASC(WIN$(I))))+ASC
(BOARD$(ASC(WIN$(I+1))))+ASC(BOARD$(AS
C(WIN$(I+2))))
151Ø IF (SUM=36Ø) OR (SUM=333) THEN PO
P :GOTO 159Ø
152Ø IF PLAY THEN GOTO 156Ø
153Ø FOR J=Ø TO 4
154Ø IF SUM=PLAYS(J) THEN PLAY=1
155Ø NEXT J
156Ø NEXT I
157Ø IF PLAY THEN RETURN
159Ø IF SUM=36Ø THEN WIN=3
16ØØ IF SUM=333 THEN WIN=4
161Ø IF (WIN=1) AND (PLAY=Ø) THEN WIN=
2
162Ø RETURN
171Ø TRAP 182Ø:OPEN #4,8,Ø,"P:"
172Ø FOR I=1 TO LEN(MB$)-1Ø STEP 19
173Ø J=INT(I/19)+1
174Ø IF J<1ØØØ THEN J$=""
175Ø IF J<1ØØ THEN J$=" "
176Ø IF J<1Ø THEN J$="  "
177Ø J$(LEN(J$)+1)=STR$(J)
178Ø PRINT #4;J$;"  ";MB$(I,I+8);"  ";
179Ø FOR J=I+9 TO I+18
18ØØ PRINT #4;ASC(MB$(J));" ";
181Ø NEXT J:PRINT #4:NEXT I:CLOSE #4:R
ETURN
182Ø CLOSE #4:GRAPHICS Ø
183Ø FOR I=1 TO LEN(MB$)-1Ø STEP 19:J=
INT(I/19)+1
184Ø IF J<1ØØØ THEN J$=""
```

```
1850 IF J<100 THEN J$=" "
1860 IF J<10 THEN J$="  "
1870 J$(LEN(J$)+1)=STR$(J):? J$;" ";MB$(I,I+8);" ";
1880 FOR J=I+9 TO I+18:? ASC(MB$(J));" ";:NEXT J:? :NEXT I
1890 ? "  PRESS ANY KEY TO CONTINUE GAME."
1900 IF (PEEK(764)=255) AND (PEEK(53279)=7) THEN 1900
1910 GRAPHICS 2:POKE 756,226:SETCOLOR 0,0,0:POKE 764,255
1920 POSITION 6,0:? #6;"your move":GOSUB 930:RETURN
2010 GRAPHICS 0:OPEN #3,4,0,"K:":? " Recall previous learning?";
2020 GET #3,A:? CHR$(A);:CLOSE #3
2030 IF A<>ASC("Y") THEN RETURN
2040 ? :? " What dev:filename";
2050 INPUT FNAME$
2060 TRAP 2080:OPEN #3,4,0,FNAME$
2070 FOR X=1 TO 5700:GET #3,DD:IF DD=155 THEN POP :GOTO 2078
2072 MB$(X)=CHR$(DD)
2074 NEXT X
2078 RETURN
2080 ? :? " Sorry, unable to open that file."
2090 ? " Please try again.":GOTO 2010
2110 ? :? " Save current learning."
2120 ? " What dev:filename";
2130 INPUT FNAME$
2140 TRAP 2160:OPEN #3,8,0,FNAME$
2150 PRINT #3;MB$:CLOSE #3:RETURN
2160 ? :? " Sorry, unable to open that file."
2170 ? "WINS=";WINS;" LOSES=";LOSES;" DRAWS=";DRAWS;
2180 ? " PATTERNS=";LEN(MB$)/19
2190 RETURN
```

## TYPO TABLE

Variable checksum = 2281870

| Line num range | Code | Length |
|---|---|---|
| 110 — 225 | PT | 501 |
| 270 — 430 | AK | 500 |
| 440 — 540 | OI | 522 |
| 550 — 670 | SJ | 498 |
| 680 — 810 | PN | 503 |
| 820 — 930 | NE | 553 |
| 940 — 1060 | YF | 525 |
| 1070 — 1190 | US | 396 |
| 1200 — 1320 | FT | 428 |
| 1330 — 1440 | KT | 518 |
| 1450 — 1570 | LX | 273 |
| 1590 — 1780 | UP | 347 |
| 1790 — 1900 | YE | 447 |
| 1910 — 2078 | TI | 429 |
| 2080 — 2190 | VO | 341 |




# ATARI CONTROLS YOUR ENVIRONMENT

## Simple computer appliance interface

by JEFF McHIE

Atari home computers are capable of much more than just playing games and tackling traditional programming applications. The Atari's four game controllers (two on XL models) contain sixteen lines (eight on the XL series), each of which can be set for input or output. This offers the user up to 65,536 ($2^{16}$) possible external operations.

This article explains how to set one line to output, how to turn appliances on and off, and how to dial your phone under computer control.

### SYNOPSIS

*A computer-appliance interface (CAI) is a device that lets you control appliances and other machines with your computer. Although building a CAI is not an extraordinarily complex project, you should be experienced with electronic circuit assembly before you attempt it. You must build the circuit to use the programs in this article. Do not use these programs with a joystick, or you may damage your computer. This CAI and its programs work with Atari computers of all models and memory configurations.*

### WHAT IS A CAI?

The computer-appliance interface (CAI) consists of the following circuits: a regulated 5V-DC power supply; a two-stage inverting buffer; an infrared optoisolator; a single-stage transistor amplifier; a micro relay; and a macro relay.

The power-supply circuit (Figure 1) was constructed from readily available parts, and is much larger than necessary. You can add one control-line circuit.

The main circuit (Figure 2) shows the interconnection of the two-stage inverting buffer, the optoisolator, and the amplifier that powers the micro relay. The optoisolator acts as a physical barrier between the computer and the 110V-AC circuit that is being con-

trolled. Without this protection, the computer could be electrically zapped and destroyed (see ANTIC, Systems Guide, March 1984). All parts except the micro relay are available from Radio Shack.

The micro relay, manufactured by Struther Dunn, Inc., is available from Allied, Inc., 1355 North McLean Blvd., Elgin, IL. Insert it into an IC socket for easier installation.

You'll need a DE9S connector to plug the CAI into your computer's joystick port. These are available from Atari, Radio Shack, and electronics parts stores. Figure 3 shows you which pinouts to use: Our device will use pin 3.

Soldering the connector pins to the cable's wire ends and putting on the shell are quite difficult jobs. You must be both experienced with soldering and patient to complete them successfully.

## WARNINGS

Before you attempt to build the circuit or use its associated programs, please note the following warnings:

- If you attach any non-standard device to your Atari computer, your warranty will be voided.
- You should *never* use either of the programs included in this article with a joystick attached to your computer. This could short a line and destroy the PIA chip.
- The 110V-AC power lines constitute a potential shock hazard, and must be carefully insulated.

## BUILDING THE CAI

The location of parts isn't of critical importance. I used a three-and-a-half-inch by six-inch perf panel as a base, and attached the transformer, macro relay, and cables to it. The power supply and the optoisolator/detector circuit were assembled on separate pieces of printed-circuit (PC) board. These were then attached to the main perf board.

The optoisolator consists of two components: an infrared emitter and an infrared phototransistor. To insure maximum coupling, these components should be mounted on PC board so that they almost touch; a small piece of black shrink tubing is then slipped on to hold them in alignment. Care must be taken to insure that the cases don't come in contact, however, since this would compromise the optoisolator's function. If black shrink tubing isn't used, the optoisolator will be exposed to ambient light and may not function properly.

## TAKE-APART FOR PHONE-DRIVER PROGRAM

| | |
|---|---|
| Line 10 | Dimensions A$. |
| Line 15 | Prompts user to select either toll-free or local-call format. |
| Line 20 | Prompts user to input number to be called. |
| Line 25 | Disconnects phone for a short time to clear any previous call. Sets Z1 flag (Z1=1) if toll-free option was selected. |
| Line 30 | Informs user that a call is being processed and suppresses cursor. |
| Line 40 | Starts output sequence. |
| Lines 60 & 61 | Connect phone and pause for a short time to obtain a dial tone. |
| Line 65 | Retrieves one element of A$ at a time and forces its numeric value into variable C. |
| Line 66 | If a zero is encountered in variable C, it is converted to 10. A zero must be transmitted as ten pulses to conform to protocol. |
| Line 70 | Transmits pulses to the phone; the number of pulses to transmit is defined by lines 65 and 66, and is forced into variable C. |
| Line 75 | Checks to see if flag Z1 has been set (Z1=1), indicating that a toll-free number has been input. If so, the program branches to line 270, which checks for hyphens at three locations in the phone number. |
| Line 80 | If the branch at line 75 did not occur, this code — which checks for only one hyphen — is run. Variable B (the current element) is incremented. When B=4, indicating that a hyphen numeric value is to be forced into variable C, B is incremented again so that the pulse-generation code will receive the next digit, rather than the ASCII value for a hyphen. |
| Line 90 | Checks to see if the last digit of the phone number has been processed. If not, the program continues to line 95. If the last digit has been processed, the code resets flag Z1 to zero, resets B to 1, clears the screen, turns cursor back on, and returns to line 15. |
| Line 95 | Provides a pause between the pulse series being transmitted to the phone. |
| Line 100 | Loops back to line 65 to pick up the next digit for processing. |
| Lines 150 & 200 | Prompts the user regarding the "800 number" input format. |
| Line 250 | Turns the phone line off. |
| Line 260 | Sets the number of elements to be processed to 15 by setting Z2=15. |
| Line 270 | Checks for three hyphens and skips over them when they occur. Increments variable B to select the next digit to transmit, and loops back to transmitting code. |
| Line 275 | Loop back to transmitting code. |

continued on next page

A miniature, dual-inline, reed-type micro relay can be inserted into a standard IC socket, which in turn can be mounted on the PC board. The socket's pins protrude through the back of the PC board, and it is to these pins that connections should be made.

The relay's pin-outs follow standard IC labeling practice. Pins 2 and 6 are used for coil power; pins 8 and 16 are relay contacts.

Use the specified micro relay. Other available micro relays draw more current, and may not work in this application. If you must substitute another device, make sure that its coil draws less than 10 milliamps at 5V-DC. On the other hand, any 110V-AC-coil, general-purpose macro relay should work. Its specifications aren't critical.

## ADDITIONAL WARNINGS

Once you've built the CAI, resist the temptation to try it out right away. Before exposing your expensive and delicate computer to this strange device, run a bench test to make sure that neither the power drain on Bit Line 3 nor the computer's power supply exceeds specifications.

To do this, you'll need a Simpson 260 test meter or its equivalent. First, set the test meter to the 100-milliamp scale and connect it in series from the +5V-DC connection on your power supply to pin 7 on the connector. Next, connect a shorting line to pin 4, and prepare to touch the other end to the ground on the power supply. When you insert wires into the connector, be careful not to damage the receptacles by using excessive force or a wire that is too large. Touch the shorting line to the ground. You should hear the macro relay "pull in," and your meter should read less than 50 milliamps.

Next, remove the test meter and set it to the 10-milliamp scale. Connect the +5V-DC pin directly to pin 7 and reconnect the test meter in series with your shorting line. Now, connect to ground. Again, you should hear the macro relay pull in, and your meter should read less than 1.6 milliamps. If these tests don't produce the expected amperage values or if the relay doesn't pull in, something is wrong. Stop and check for shorts, the incorrect wiring of transistors, etc. Don't use the CAI on your computer until everything checks out.

## USING THE CAI

When these bench tests produce the proper results, type in the driver program, connect the CAI to Port 1, set it for an appliance, and you're ready to go.

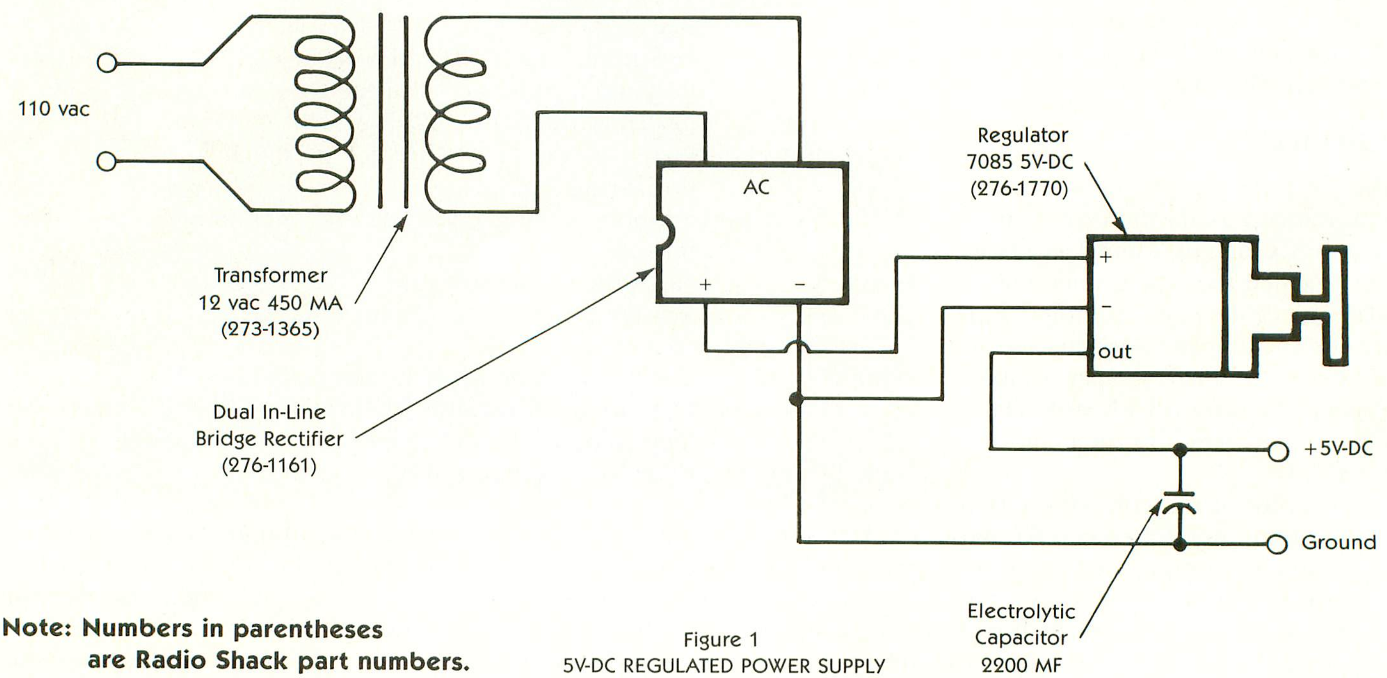
The CAI also has a telephone interface. Use Figure 4 to connect your phone to the CAI. Then type in the phone-dialer program (Listing 2), remove the phone from its cradle, and type in a phone number.

"Pulse" phone dialing is accomplished by opening and closing the phone circuit quickly, creating a "pulse series," and by holding the phone circuit closed for a short time between series.

Phone-number digits are coded so that the number "3" equals three pulses, "6" equals six pulses, etc. Zero ("0") is coded as ten pulses.

This article deals with only a few of the ways in which you can interface your Atari with the outside world. Other possibilities include adding a four-to-sixteen-line decoder that would provide you with control of as many as sixteen devices from one port plug, and remote control of the appliances in your home via your Atari.

*Jeff McHie, a fifteen-year-old high school sophomore who lives in South Holland, Illinois, is currently studying mainframe programming. His other computing interests range from writing machine-language arcade games to building a "stand-alone" computer dedicated to home security and energy conservation. Jeff has been exposed to computers from the first grade on, and is a member of Computer Squad, a local Atari users' group.*




**Note: Numbers in parentheses are Radio Shack part numbers.**

Figure 1
5V-DC REGULATED POWER SUPPLY

See page 108 for Figure 2.

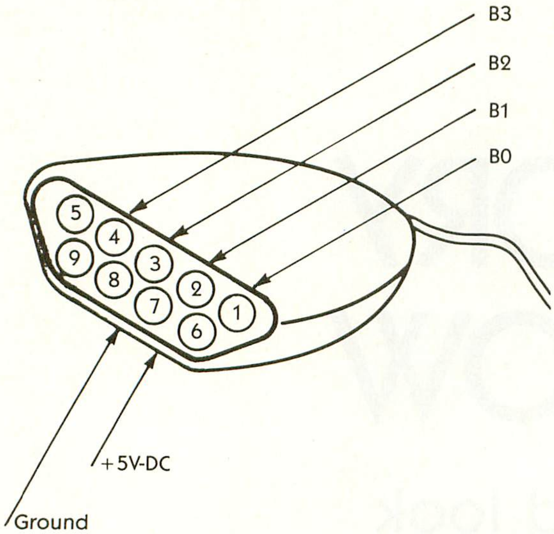



Figure 3

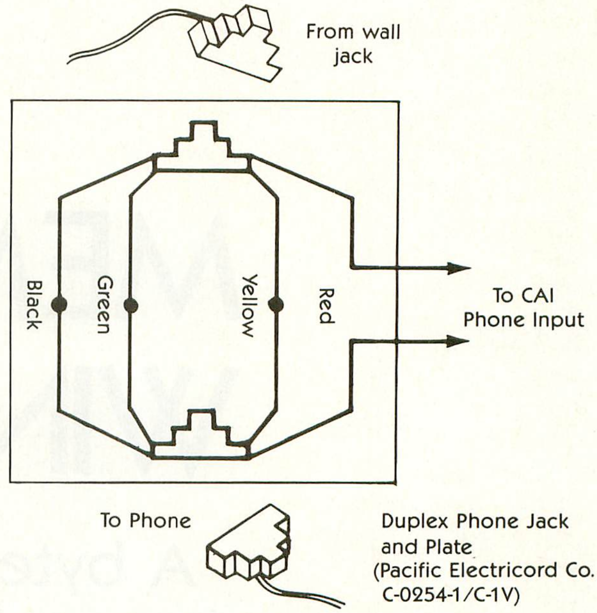



Figure 4
CAI PHONE CONNECTOR

Listing 1

```
10 REM WARNING: DO NOT RUN THIS
       PROGRAM WITH JOYSTICK ATTACHED
20 REM C.A.I DRIVER PROGRAM
30 PORTA=54016:REM PORTA DATA OR DIREC
TION REGISTER
40 PACTL=54018:REM PORTA CONTROL REGIS
TER,SELECTS WHETHER PORTA WILL BE A DA
TA OR DIRECTION (INPUT/OUTPUT) REG.
45 POKE PACTL,56:REM SET PORTA AS A DI
RECTION REGISTER
50 POKE PORTA,8:REM SELECT BIT 3 AS AN
 OUTPUT BIT.THE OTHER BITS WILL NOT BE
 USED AND WILL REMAIN AS INPUT BIT
60 POKE PACTL,60:REM RESET PORTA AS A
DATA REGISTER
65 POKE PORTA,8:REM INTIALIZE "OFF"
 SETTING
70 REM NOW IF WE SET BIT 3 (POKE PORTA
,8)BIT LINE 3 WILL GO HIGH,IF WE POKE
PORTA,0 BIT LINE 3 WILL GO LOW
80 REM LINES 10-70 SELECT PORTA,BIT3 A
S AN OUTPUT LINE
90 DIM C$(3)
100 INPUT C$
110 IF C$="ON" THEN POKE PORTA,0
120 IF C$="OFF" THEN POKE PORTA,8
130 GOTO 100
140 REM LINES 100-130 LET YOU TURN ON
OR OFF APPLIANCES BY EITHER TURNING ON
 OR OFF BIT 3
```

Listing 2

```
5 REM PHONE DRIVER
9 B=1
10 DIM A$(100):? CHR$(125)
15 POSITION 3,2:? "IF YOU WISH TO DIAL
 A TOLL FREE         NUMBER TYPE (TOLL F
REE)."
20 POSITION 3,5:? "PLEASE PRINT THE NU
MBER YOU WISH TO    CALL IN THIS FORMAT
 (123-4567).":? "↓":Z2=9:INPUT A$
25 POKE 54016,0:FOR I=0 TO 200:NEXT I:
IF A$(1,4)="TOLL" THEN Z1=1:Q=1:? CHR$
(125):GOTO 150
30 POKE 752,1:POSITION 10,13:? "PLEASE
 WAIT CALLING"
40 POKE 54018,56
60 POKE 54016,8
61 FOR O=0 TO 250:NEXT O
65 C=VAL(A$(B,B))
66 IF C=0 THEN C=10
70 FOR I=1 TO C:POKE 54016,0:FOR T=0 T
O 1:NEXT T:POKE 54016,8:FOR T=0 TO 1:N
EXT T:NEXT I
75 IF Z1=1 THEN 270
80 B=B+1:IF B=4 THEN B=B+1
90 IF B=Z2 THEN B=1:? "↖":Z1=0:POKE 75
2,0:GOTO 15
95 FOR G=0 TO 80:NEXT G
100 GOTO 65
150 ? "↖":POSITION 2,2
200 ? " IF YOU ARE DIALING A TOLL FREE
 NUMBER DIAL IN THIS FORMAT(1-800-123-
4567).":? "↓":INPUT A$
250 POKE 54016,0:FOR I=0 TO 200:NEXT I
260 Z2=15
265 GOTO 30
270 B=B+1:IF B=2 OR B=6 OR B=10 THEN B
=B+1:GOTO 90
275 GOTO 90
```

continued on page 108

# MEMORY WINDOW

## A byte-sized look at your Atari memory

by DAVE MENTLEY

If you've ever wondered what the inside of your computer's memory looks like, this program may help satisfy your curiosity by opening a window for you directly into memory.

### SYNOPSIS

*This program lets you view any portion of your computer's memory on the screen. It runs on all Atari computers, and requires 16K RAM and BASIC. A joystick is optional.*

### HOW TO USE THE PROGRAM

When you first RUN the program, the screen is split horizontally into two areas. The upper half of the screen contains a Graphics 0 text screen which holds eight lines of 32 characters each—exactly enough to display 256 characters, or one page of memory. The bottom half of the screen shows which memory locations (in decimal form) are on display, and the number of the current page of memory.

The initial display starts at the location of the Graphics 0 text screen you see when you turn on the computer. As a result, you'll see the message "Current Memory = " and the location numbers flashing on both halves of the split screen. You can use the keyboard or a joystick to move the display through memory.

Pressing [.] or the joystick button resets you to Page Zero. If you press [>] or push the joystick forward, the window moves forward through memory one page at a time. If you press [<] or pull the joystick back, you'll move backwards through memory. Bytes in memory are displayed as their internal Atari-character-set equivalents. Use the up arrow or the down arrow, or push the joystick right or left to move through memory one byte at a time.

### HOW THE PROGRAM WORKS

The program changes the address of screen memory in the display list according to input from the joystick or keyboard. The [BREAK] key is disabled, so you must either press [RESET] or reboot to end the program.

### PROGRAM TAKE-APART

Line 70: TRAPs to a RUN command, disables [BREAK], sets screen margins.

Line 80: Disables cursor, sets narrow (32-column) playfield.

Line 90: POKEs new display list (DL) into Page Six from DATA statements.

Lines 100–150: Set up new DL and activate it.

Lines 160–170: Print current memory and page values.

Lines 180–220: Accept joystick and keyboard input.

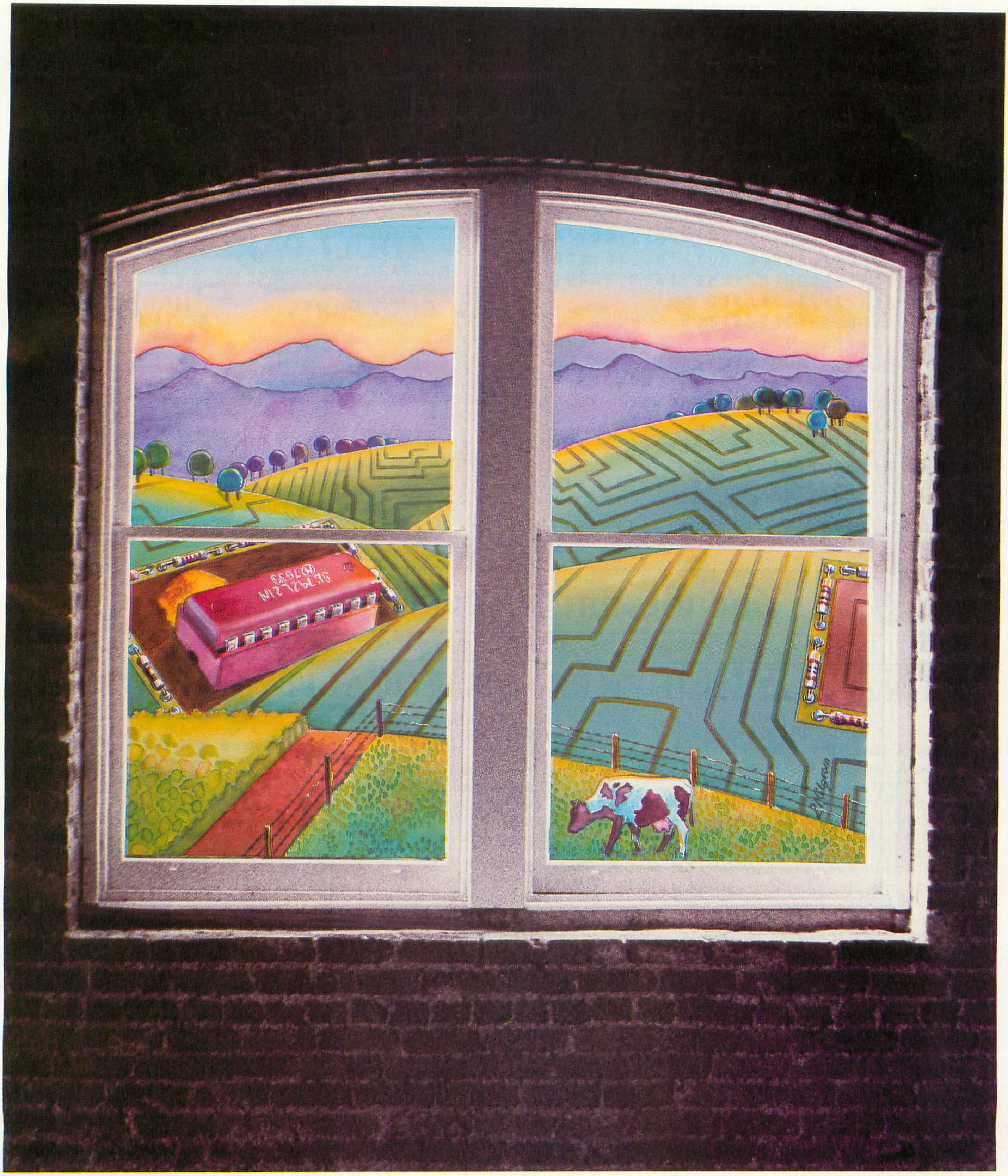
Line 230: Restricts input range to actual memory locations.

Lines 240–260: Adjust DL to display new memory range and to branch back to display and input routine.

*Dave Mentley is a consultant in the area of flat panel displays. He uses the Atari 800 for report writing and data base maintenance. Dave is a former president of ABACUS, an Atari Users' Group in San Francisco.*

continued on page 64

ILLUSTRATION: LILIANNE MILGROM PHOTO: LINDA TAPSCOTT



```
10 REM *****************************
15 REM ***    MEMORY WINDOW      ***
20 REM *** BY DAVE MENTLEY       ***
25 REM *** BASED ON PROGRAM BY   ***
30 REM ***      MIKE MOREY       ***
35 REM ***    ANTIC MAGAZINE     ***
50 REM *****************************
70 GRAPHICS 0:TRAP 270:POKE 16,64:POKE
 53774,64:POKE 82,0:POKE 83,30
80 POKE 752,1:POKE 559,33
90 FOR A=1536 TO 1563:READ B:POKE A,B:
NEXT A
100 DLST5=1540:DLST6=1541
110 SCRLO=PEEK(88):SCRHI=PEEK(89)
120 POKE DLST5,SCRLO:POKE DLST6,SCRHI
130 POKE 1552,SCRLO:POKE 1553,SCRHI
140 MEM=SCRHI*256+SCRLO
150 POKE 560,0:POKE 561,6
160 ? CHR$(125):? "          current mem
ory=":? MEM;" TO ";MEM+256
170 ? "          PAGE= ";INT(MEM/256)
180 IF STRIG(0)=0 OR PEEK(764)=34 THEN
 MEM=0:POKE 764,0
190 IF STICK(0)=14 OR PEEK(764)=55 THE
N MEM=MEM+256:POKE 764,0
200 IF STICK(0)=13 OR PEEK(764)=54 THE
N MEM=MEM-256:POKE 764,0
210 IF STICK(0)=7 OR PEEK(764)=14 THEN
 MEM=MEM+1:POKE 764,0
220 IF STICK(0)=11 OR PEEK(764)=15 THE
N MEM=MEM-1:POKE 764,0
230 IF MEM<0 OR MEM>65280 THEN MEM=652
80
240 MEMHI=INT(MEM/256):MEMLO=MEM-256*M
EMHI
250 POKE DLST5,MEMLO:POKE DLST6,MEMHI
260 GOTO 160
270 RUN
280 DATA 112,112,112,66,0,0,2,2,2,2,2,
2,2,0,0,71,0,0,0,2,7,7,7,2,6,65,0,6
```

# CP/M ON THE ATARI!

## HOW? WITH THE INCREDIBLE

# ATR8000

The ATR8000 is a 4 MHz, Z80, 64k RAM, CP/M microcomputer that is also the complete ATARI interface. Besides bringing CP/M to the ATARI home computer, the ATR8000 also enhances the ATARI's operation. The ATR8000 has ports for running a serial or parallel printer for ATARI DOS, complete with a built-in 48k buffer. And, the ATR8000 enables the use of standard 5¼" and 8" drives for ATARI DOS!

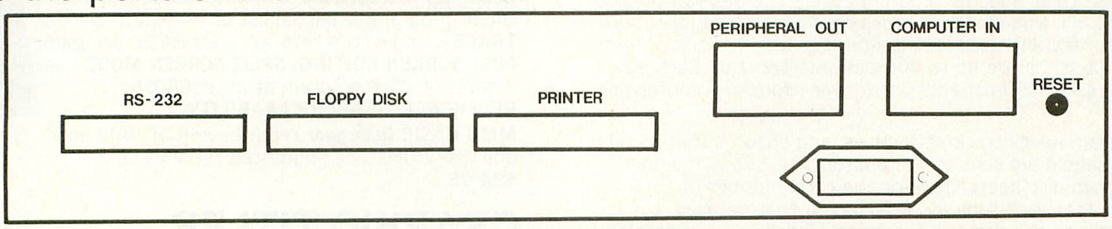
## The ATR8000-ATARI system runs these DOSes:

**ATARI DOS** This is the operating system of ATARI computers. The ATR8000 runs this DOS from any standard disk drive or from an ATARI 810 disk drive.

**MYDOS** This multi-density DOS is an ATARI compatible DOS. In single density, it runs on an ATARI 810 or a standard drive. In double density, MYDOS runs on standard drives, single and double-sided, 5¼" and 8"!

**CP/M** This popular operating system comes with the ATR8000. It is a double density DOS that runs on standard drives. The ATR8000 reads CP/M disks from many other microcomputers, too!

## What do the ports of the ATR8000 do?




**RS-232:** Runs a serial printer or a modem in ATARI DOS and CP/M operation. Includes an automatic 48k printer buffer in ATARI operation. Software includes modem programs.

**FLOPPY DISK:** Runs both 5¼" and 8" standard disk drives. Runs up to four drives that are any mixture of size, density (single, double or quad) and type (single-sided or double-sided).

**PRINTER:** This standard parallel port runs a parallel printer in ATARI and CP/M operation. Includes an automatic 48k printer buffer in ATARI operation.

**PERIPHERAL OUT:** Interfaces ATARI peripherals to the ATR8000 for use in ATARI operation. Peripherals, like an ATARI 810 drive, are connected with an ATARI Daisy Chain Cable.

**COMPUTER IN:** The ATARI home computer is connected to the ATR8000 here. For CP/M operation, it is also possible to connect an RS-232 terminal here.

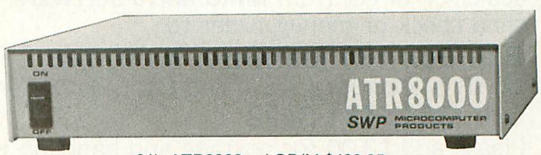


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**MICROCOMPUTER PRODUCTS**

For further information contact your local dealer or SWP at:

2500 E. Randol Mill Road
Suite 125
Arlington, TX 76011
817-861-0421 or
metro 469-1181




64k ATR8000 w/ CP/M $499.95

# MMG'S Great New Programs Are The Source of Power For Your Atari System*

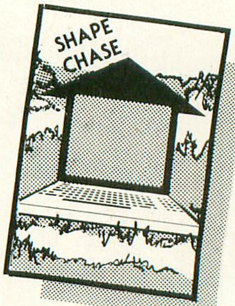


## PYRAMID RUN

**Pyramid Run** is a race against time and the Demon Protectors of the tomb of Egyptian Pharaoh Cheotemkahmen set upon a scrolling view of the tunnels of the Great Pyramid. Begin at any of five levels of difficulty. Full color graphics and sound effects highlight this game, with dozens of the most hideous monsters in computer gaming. In addition, Pyramid Run is two games in one: as you complete each pyramid, you play an interlude board to win additional lives for the next run.

**Pyramid Run** requires 48K of RAM, one disk drive and one joystick. The suggested retail value is **$29.95.**

## SHAPE CHASE




**Shape Chase** is an educational program that introduces pre-school children to shapes, numbers, and the alphabet in three fun-to-play learning games. Your children learn about **Letters, Numbers, Shapes, Colors, Pattern Matching, and Memory Retention.** The programs automatically advance the child at his own learning pace. The disk holds the child's attention by varying the game scenario and zeroing in on those areas that need reinforcement.

**Shape Chase** is available on disk only, requires 48K of RAM and one joystick. The suggested retail value is **$34.95.**

# POWERFUL UTILITIES



## A POWERFUL NEW PROGRAM FOR DENTISTS!

## FILL-N-BILL

**FILL-N-BILL** is a complete package for automation of the billing and bookkeeping functions of the small dental office. The program allows the entry of up to 255 standard American Dental Association codes for procedures, with descriptions and fees. Billings are produced by entering the appropriate code, and the program enters the description and fee on the bill. Non-standard codes may be entered into the code dictionary and used like standard codes.

**FILL-N-BILL** will store up to 400 patients per disk. Each disk will store up to 960 patients' visits, with four procedures per visit.

The program keeps track of families, and ensures that all bills for a household are sent to the appropriate family member. The program also keeps track of the total number of procedures for each code by provider, so that detailed information on the practice for up to 16 providers in an office may be obtained.

Insurance forms are printed using the standard ADA-approved format acceptable by all major insurance companies. Monthly statements can be printed in addition to those provided at the time of treatment. Periodic purging to a historical data disk allows permanent storage.

**FILL-N-BILL** requires 48K, any parallel printer, and at least two disk drives. The suggested retail price is **$999.95.** Specific customized versions are available at extra cost from MMG.

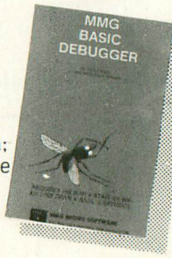
## BASIC COMMANDER




**MMG BASIC Commander** has capabilities found only on much larger computers. Single keystrokes enable you to **LIST, SAVE, ENTER, LOAD** or **RUN** files from your disk, and access DOS functions. **RENAME, DELETE, LOCK, UNLOCK** even **FORMAT** disks from BASIC! There are three programmable keys for your favorite commands plus **AUTOMATIC LINE NUMBERING, BLOCK DELETE,** and **RENUMBERING.**

**MMG BASIC Commander** requires 16K of RAM and one disk drive. The suggested retail value is **$34.95.**

## BASIC DEBUGGER




**MMG BASIC Debugger**, companion to MMG BASIC Commander, is an all machine language program co-resident with your BASIC program. The Debugger dramatically simplifies debugging your BASIC program. A partial list of its features: **TRACE** - single step through your BASIC program; **FULL SCREEN EDITING; SPLIT SCREEN MODE** - see 2 parts of your program at once; **CROSS REFERENCE; SEARCH CAPABILITY.**

**MMG BASIC Debugger** requires 24K of RAM and one disk drive. The suggested retail value is **$34.95.**

## GRAPHIC TITLER




**MMG Graphic Titler** is used to create a wide variety of screen displays and sounds. These displays incorporate various sizes of text and multicolored high resolution graphics. You can save or change the screens and incorporate them into display sequences. The REPLICATE command will replicate a figure many times. Detailed step-by-step instructions and many ready-to-run examples are included on the diskette.

**MMG Graphic Titler** requires 48K of RAM and one disk drive. The suggested retail value is **$39.95.**

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# LITTLE BROTHER GROWS UP

## An audio/visual output mod for the 400

by DICK SLAVENS and JIM LEE

**SYNOPSIS**

*This article explains how to adapt an Atari 400 for audio and video output. The project involves wiring and building a circuit board, so you should be fairly experienced with electronics before undertaking it.*

If you've installed 48K and a good keyboard in your Atari 400, you know that it's as capable a computer as its big brother, the 800—with one exception. The 400 does not provide a DIN jack for audio and video output.

If you attach a high-quality color monitor to your 400, this will improve its graphics so much that you'll practically be able to "see the whites of your enemy's eyes." Similarly, if you connect the 400's audio output to a stereo, you'll be able to hear the "crash of thunder" as you destroy him. This article explains how to accomplish both of these goals for $20 and a few hours of work with a soldering gun.

### BUILDING A CIRCUIT BOARD

Our goal is to build a circuit board, and then connect it to a 400's motherboard. (To undertake this project, you should be fairly adept at soldering. If you've assembled a Heathkit, you'll probably have no trouble.)

Most of the component values are not critical, so feel free to experiment if your component doesn't have the exact value noted here. All components should be available from a local electronics store. The new output jack we're creating will provide the following features: composite luminance, composite video, composite chroma and audio output.

Figure 1 shows a suggested layout for the circuit board. The small size of the board and the vertical mounting of resistors are necessary because of the limited amount of space within the 400 case. We recommend using a glass-epoxy "perf" board with point-to-point wiring. This circuit board comes with holes already drilled; buy the type with 0.10-inch hole spacing. Try parts out for size and fit before you cut the board.

The layout of parts is not critical, but you should try to keep leads as direct as possible. Use 24-gauge, solid wire for on-board connections. "Flea clips" can be used to mount components. These small, U-shaped metal clips are pointed at one end, which can be inserted into the perf board. Integrated-circuit (IC) chips should be mounted in sockets.

### AUDIO OUTPUT

U1 (Figure 2) is a CMOS hex buffer (high-impedance input and low-impedance output), which is followed by a resistive-combiner network. Q1 and Q2 are emitter-follower amplifiers; they provide current gain for the low-impedance video outputs. U2 is an audio-power-amplifier IC. Its audio output (approximately 1/8 watt) will drive a good-sized speaker. An outboard potentiometer can be added to control volume (250 ohms). Output can also be used with the auxiliary input of a stereo system.

U1 (CD4050) is sensitive to static charges. For example, if you place the circuit board on a sheet of aluminum foil and touch the IC's conductive foam or plastic packaging to the foil, one zap of static discharge will destroy the chip.

RG-174 coaxial wire can be used for the video outputs; use stranded 24-gauge wire for all other lines. No heat sink is required for the audio amp IC (U2).

### INSTALLING THE BOARD

When you're ready to install the board, you'll need to disassemble your 400. First, disconnect all cables and remove any cartridges. Then turn it over and remove the screws that hold the upper and lower halves together. Once this is done, detach the keyboard and remove the large metal "shielding" casting. This will expose the section of the

continued on next page

main board to which your modified board will be added. (Take careful note of where and how the pieces come apart.)

You'll have to cut a slot in the rear of the metal housing (in the lower left-hand corner, as viewed from the rear of the 400) to create an exit for video and audio cables. We drilled a 3/8-inch hole and then made two cuts with a hacksaw to form a slot. Be sure to keep metal filings away from the circuit boards, clean the housing very carefully, and round off the corners of the slot with a file to protect the cable's insulation. In addition, cut the three vertical ribs in the plastic case (next to the TV-channel select switch) to provide an exit for the female DIN jack.

## INTERFACE CONNECTIONS

Figure 3 shows the locations of the interface connections on the motherboard. Care should be taken to avoid heat damage to the board. (Tip temperature should be 700–800 degrees F. Solder only at the "pads"/component connection points indicated.) Be sure to adhere strictly to the indicated locations, components, and sides for connections. Do not change or reverse any of these connections, especially C 183 (the 5V-DC/ground connection)!

No further adjustments are necessary, and this new board will not affect the RF output to your regular T.V. Simply use the composite-luminance output and ground for a monochrome monitor and the composite video and ground for a color monitor. Sound is supplied by the audio output and ground.

## ADDITIONAL PRECAUTIONS

To keep the board from shorting out, wrap it in black-cloth electrical tape, rather than plastic tape. Make up a female DIN plug connection (plug side), and then make connections to your new board. This will keep things neat. Also, provide a "strain relief" that will keep you from pulling the wiring loose when you disconnect the monitor cable. We suggest that you use a good-sized wire tie around the lines that go out to the female DIN plug, just inside the metal shielding case. This will provide relief when the external monitor cable is detached; the female DIN plug (keep it short!) will take care of insertions.

While we're discussing "strain reliefs," note that in Figure 1 the lines leaving the board are on the top-outside row of holes. This result is accomplished by enlarging these holes slightly to allow insulated wire to pass through to the bottom of the board. This keeps the connections from being pulled loose.

Also, note (see Figure 1) that we've "notched" one corner of the board to help trace the circuitry. Where wires join, a black dot is shown. A "jump-over" is indicated where wires cross without joining; a hole is shown where a wire passes through the board. If you encounter any trouble in completing this modification, trace your circuits using the schematics shown in Figures 2 and 3. They're the "source" for the board shown in Figure 1.

## COMPONENTS

Resistors: 1 @ 1k, 3 @ 2.2k, 1 @ 4.7k, 1 @ 9.1k, 1 @ 18k, 3 @ 20k, 1 @ 36k, 1 @ 40k, 1 @ 75k, 1 @ 120k, 1 @ 220k and 1 @ 330k (all 1/4w — 5%)

Capacitors: 1 @ 100mf, 1 @ 100pf and 3 @ 0.1mf (5–16 VDC)

Transistors: 2 @ 2N2222

Diodes: 1 @ 1N4148

Chips: 1 @ CD4050 hex buffer and 1 @ LM386 audio amp

Miscellaneous: Glass-epoxy perforated board (4″ × 6″), RG-174 coax cable (3 ft.), 1 @ 8-pin wire wrap IC socket, 1 @ 16-pin wire wrap IC socket and 1 @ female DIN plug with boot.

**See pages 105–107 for Figure 1, Figure 2 and Figure 3.**

*Jim Lee and Dick Slavens are residents of Napa, California. Jim is a design supervisor for the Bechtel Group, Inc., of San Francisco. Trained as an architect, he designs refineries, chemical plants and nuclear fuel processing facilities. Dick does telecommunications work for Pacific Gas & Electric, also in San Francisco. He originally bought his 400 as a game machine. Feeling constricted by its limitations, however, he worked to improve his machine. This article is a direct result of those efforts.*

## NOTICE

Your next issue of ANTIC will be dated

**JUNE 1984**

There will be no cover date for MAY, 1984, but

**WE ARE NOT SKIPPING AN ISSUE!**

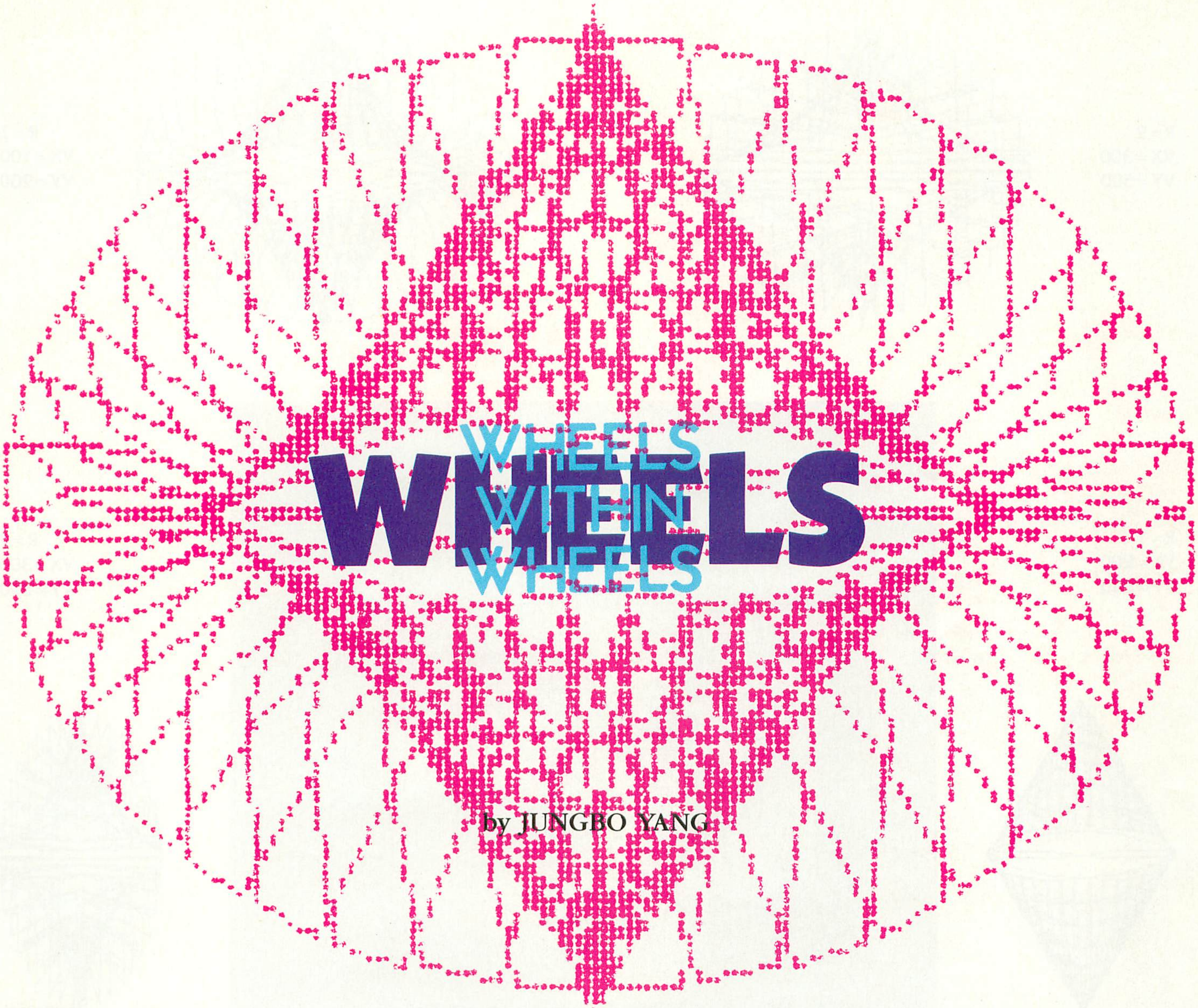
We are just advancing the cover date to facilitate distribution.

The June issue will be Vol. 3, No. 2.

There will be 12 issues in the volume.

Subscriptions will be adjusted automatically.

Expect your June issue in mid-May.



# WHEELS WITHIN WHEELS

by JUNGBO YANG

## SYNOPSIS

*This program runs on all Atari computers, regardless of memory configuration.*

This short graphics program draws various patterns on the screen. These patterns are generated by tracing a moving point with straight-line segments.

The motion of the point is determined by three numbers provided by the user. These numbers are the rotation angle (R), horizontal-variation factor (VX), and vertical-variation factor (VY). R is a whole number between zero and 359. (The program does not check for invalid input numbers.)

R determines how many lines appear in the drawn pattern. VX (any whole number) creates horizontal variations; VY causes vertical variations.

### EXAMPLES

If the numbers 10, 0 and 0 are entered for R, VX and VY respectively, the resulting drawing will be a circle with 36 straight-line segments. The combination of 60, 0 and 0 creates a hexagon; 144, 0 and 0 result in a five-point star, and so on.

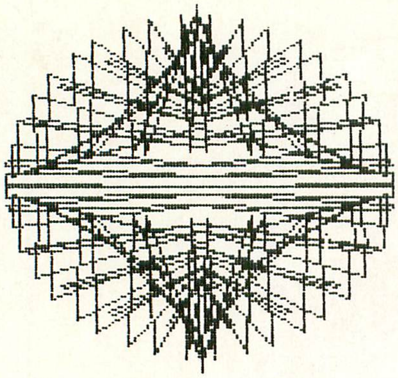
The maximum number of line segments possible in a pattern is 360. This can be produced by entering any prime number for R. When the value for either VX or VY is not zero, the pattern's shape will not be a circle. Instead, WHEEL will draw . . . who knows what? Try your favorite numbers and see what happens.

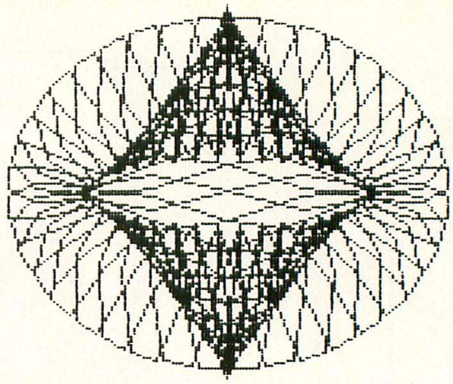
By the way, WHEEL can be easily modified by using Atari Graphics Modes 9, 10 or 11—instead of Graphics Mode 8—to achieve interesting color effects.

*Jungbo Yang received a B.S. degree in computer science in 1978. He is currently employed by CitiCorp in Santa Monica, California, where he develops software on VAX/UNIX and other mini/micro systems. Jungbo recently purchased an Atari 800 and is now writing enhanced pattern-generating programs in Forth.*

continued on next page

R=2
VX=300
VY=500

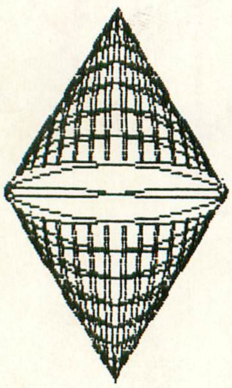




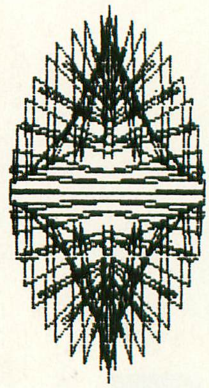
R=7
VX=100
VY=200

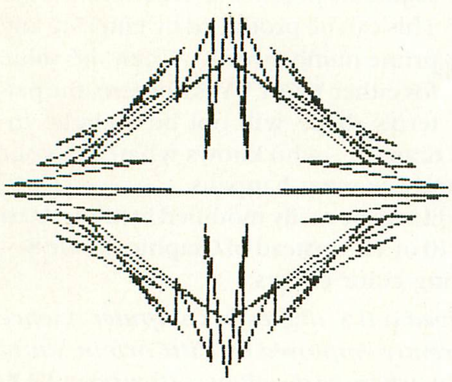
```
90 REM WHEEL
92 REM BY JUNGBO YANG
94 REM ANTIC MAGAZINE
100 DIM ANS$(1)
200 GRAPHICS 8:? "COLOR [0-14]";:INPUT
 COL
300 SETCOLOR 2,COL,0:SETCOLOR 4,COL+1,
4:SETCOLOR 1,COL,12
400 COLOR 1:CX=180:CY=80:DEG
500 PLOT CX,CY+70:INC=0
600 ? "R,VX,VY";:INPUT ROT,VX,VY
800 INC=INC+ROT
850 IF VX=0 THEN NX=INT(SIN(INC)*70):G
OTO 1000
900 NX=INT(SIN(INC)*ABS(SIN(INC*VX))*7
0)
1000 NY=INT(COS(INC)*ABS(COS(INC*VY))*
70)
1100 DRAWTO NX+CX,NY+CY
1200 IF NX<>0 OR NY<>70 THEN 800
1300 ? "MORE? [Y/N] ";:INPUT ANS$
1400 IF ANS$="Y" THEN GOTO 200
1500 GRAPHICS 0
```

R=1
VX=200
VY=200

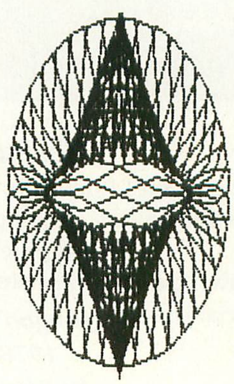


R=2
VX=300
VY=500

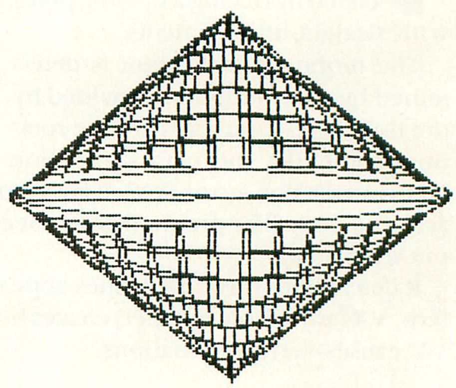




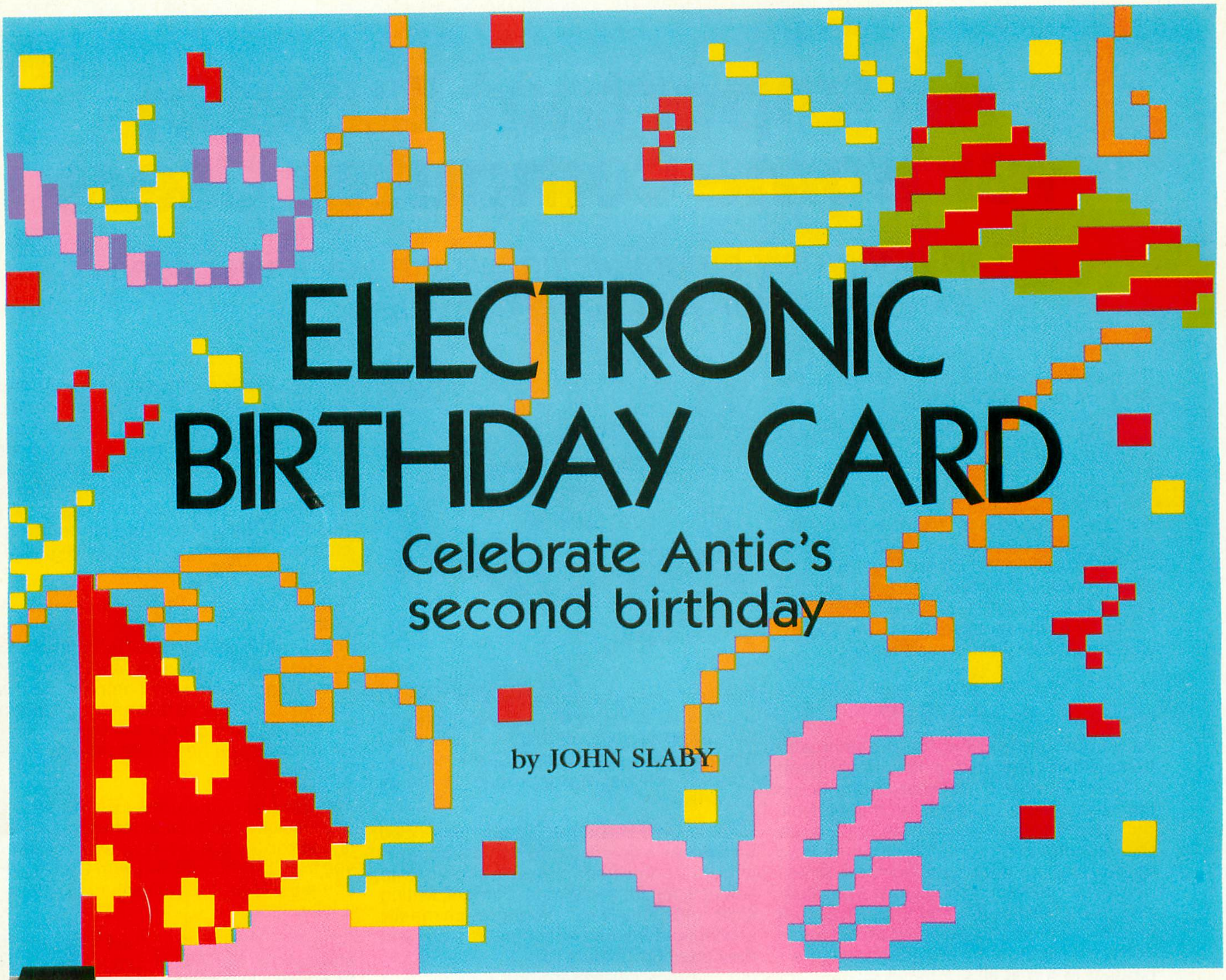
R=5
VX=200
VY=200



R=7
VX=100
VY=200



R=1
VX=200
VY=200



# ELECTRONIC BIRTHDAY CARD

## Celebrate Antic's second birthday

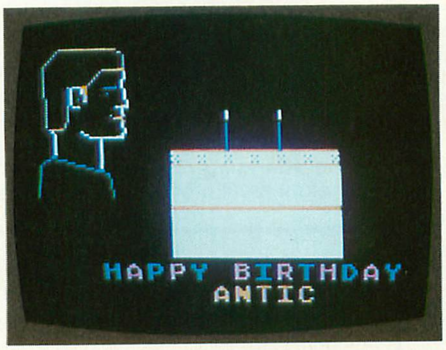
by JOHN SLABY

This program was written for my son's first birthday. Its programming techniques include an altered display list and use of the real-time clock for timing music routines.

Type in the program and SAVE a backup copy. When you RUN it, you'll first be asked for "OLD OR NEW (O/N)?". If you type [O], the data in line 730 will be used.

If you type [N], you're prompted for the recipient's name, age, sex, and birth date. Then the program waits for you to press a key before doing its thing.

If you have a 410 or 1010 program recorder, you can add a prerecorded message to the program. This will play while a gift wrapped package is displayed on the screen. The message can be up to 18 minutes long. Respond with [N] to the Old/New prompt and enter the necessary data. If you're using cassette only, record the message immediately after the program on the tape. If you're running the program from disk, record the message at the beginning of the tape. Time the recording in seconds and enter this amount at the prompt. Make sure the PLAY button on the recorder is depressed when you RUN the program.




### SYNOPSIS

*This computerized birthday card runs on any Atari system with BASIC and at least 16K RAM. If you have a 410 or 1010 program recorder, you can add a recorded message to the card.*

If you have a friend who has an Atari and a program recorder, you can send him a Happy-Birthday-card tape with a prerecorded message. Record the message immediately after the program on the tape, and ask your friend to make sure that the recorder PLAY button is depressed while the program is running.

Divide the message time (in seconds) by four, and replace the 0 at the end of line 5 (TIME=0) with this quantity. Change GOSUB 700 in line

10 to GOSUB 730. Replace the strings (in quotes) and the number for AGE in line 730 with the appropriate information. The proper sequence is: CSAVE the program, record the message, make the program changes, rewind the tape fully, and then CSAVE the program again.

Once the program has run, it can be rerun by pressing any key. If a prerecorded message is used, the tape should be rewound first.

*John Slaby is a chemical engineer by profession. He bought his Atari 400 in 1981, programs in Atari BASIC and machine language, and especially enjoys games and graphics. Several of his programs have been published.*

```
1 REM BIRTHDAY CARD
2 REM BY JOHN SLABY
3 REM ANTIC MAGAZINE
5 DIM NAME$(20),PRF$(2),SEX$(4),ST$(20
),DATE$(20):TIME=0
10 GOSUB 700:POKE 764,255:? "⬉":? "PRE
SS ANY KEY TO RUN."
15 IF PEEK(764)=255 THEN 15
20 GOSUB 7000:POKE 764,255:OUT=0:GOSUB
 5000:SETCOLOR 0,0,14:GOSUB 2000
25 GOSUB 1000:SETCOLOR 0,0,14:SETCOLOR
 1,3,6:GOSUB 6000
30 REM DRAW CAKE
35 POKE 765,1:COLOR 1:PLOT 112,78:DRAW
TO 112,40:DRAWTO 50,40
40 POSITION 50,78:XIO 18,#6,0,0,"S:"
50 REM DRAW ICING
60 COLOR 2:FOR S=40 TO 45 STEP 5:PLOT
50,S:DRAWTO 112,S:NEXT S:PLOT 50,60:DR
AWTO 112,60:PLOT 50,61:DRAWTO 112,61
70 FOR X=50 TO 110 STEP 10:PLOT X,42:P
LOT X+2,42:PLOT X+1,43:PLOT X,44:PLOT
X+2,44:NEXT X
80 REM DRAW CANDLES
82 GE=AGE:IF AGE>30 THEN GE=30
85 PLACE=62/(GE+1):P=112-PLACE
90 FOR I=1 TO GE:COLOR 3:PLOT P,30:DRA
WTO P,40:COLOR 1:PLOT P,26:DRAWTO P,28
:P=P-PLACE:NEXT I
99 GOTO 200
100 XIO 18,#6,0,0,"S:":RETURN
110 TRAP 40000:GOTO 755
120 TRAP 40000:GOTO 925
200 REM PLAY SONG
205 RESTORE 300
210 FOR X=1 TO 50:READ V1,V2,V3,BEAT
220 POKE 20,0
230 SOUND 1,V1,10,8:SOUND 2,V2,10,7:SO
UND 3,V3,10,7
240 IF PEEK(20)<BEAT THEN 240
250 NEXT X
300 DATA 81,96,121,15,0,96,121,3,81,96
,121,15
310 DATA 0,0,0,3,72,91,121,30,0,0,0,3
320 DATA 81,96,121,30,0,0,0,3,60,72,91
,30
330 DATA 0,0,0,1,64,81,108,60,0,0,0,3
340 DATA 81,96,121,15,0,96,121,3,81,96
,121,15
350 DATA 0,0,0,3,72,91,121,30,0,0,0,3
360 DATA 81,96,121,30,0,0,0,3,53,64,81
,30
370 DATA 0,0,0,3,60,81,96,60,0,0,0,3
380 DATA 81,96,121,15,0,96,121,3,81,96
,121,15
390 DATA 0,0,0,3,40,0,60,30,0,0,0,3
400 DATA 47,60,72,30,0,0,0,3,60,81,96,
30
410 DATA 0,0,0,3,64,81,108,30,0,0,0,3
420 DATA 72,91,121,30,0,0,0,3,45,60,72
,15
430 DATA 0,60,72,3,45,60,72,15,0,00,0,
3
440 DATA 47,60,72,30,0,0,0,3,60,81,96,
30
450 DATA 0,0,0,3,53,64,91,30,0,0,0,3,6
0,81,96,60,0,0,0,0
500 REM BLOW OUT CANDLES
505 COLOR 1:SOUND 0,30,8,1
510 PLOT 28,28:DRAWTO 24,28:DRAWTO 22,
26:IF OUT=1 THEN COLOR 2:GOTO 525
520 COLOR 0
525 PLOT 28,27:PLOT 29,28:DRAWTO 32,28
:IF OUT=1 THEN GOTO 600
530 COLOR 0:FOR I=0 TO GE:PLOT P,26:DR
AWTO P,28:FOR X=1 TO 40:NEXT X:P=P+PLA
CE:NEXT I
540 OUT=1:COLOR 0:SOUND 0,0,0,0:GOTO 5
10
600 REM CHANGE WORDS
610 RESTORE 620:GOTO 1040
620 DATA 64,64,64,64,64,64,64,64,64,64
,64,64,64,64,64
630 ST$=NAME$:NAME$="LET'S EAT CAKE":G
OSUB 1070
640 NAME$=ST$:POKE 764,255
650 IF PEEK(764)=255 THEN 650
660 GOTO 20
670 END
700 REM INITILIZE STRINGS
710 ? "⬉":? "OLD OR NEW (O/N)":INPUT S
EX$:IF SEX$(1,1)="N" THEN GOTO 740
720 IF SEX$(1,1)<>"O" THEN GOTO 710
730 NAME$="STEPHEN":ST$="FEBRUARY 6,19
82":SEX$="MALE":AGE=1:GOSUB 790:RETURN

740 ? "⬉":? "NAME OF BIRTHDAY PERSON";
:INPUT NAME$
750 ? "SEX (M/F)";:INPUT SEX$:IF SEX$(
1,1)<>"M" AND SEX$(1,1)<>"F" THEN 750
755 TRAP 110
760 ? "AGE ";:INPUT AGE
770 ? "DATE OF UPCOMING BIRTHDAY ":INP
```

continued on next page

```
UT ST$
780 GOSUB 790:GOTO 900
790 Q=LEN(ST$):ROT=0:CT=1
800 FOR I=1 TO Q:IF ASC(ST$(I,I))=32 T
HEN ROT=0:GOTO 815
805 IF ASC(ST$(I,I))<65 AND ASC(ST$(I,
I))>31 THEN GOSUB 860:GOTO 815
810 GOSUB 820
815 DATE$(I,I)=CHR$(ASC(ST$(I,I))+ROT)
:NEXT I:RETURN
820 IF CT=1 THEN ROT=128:GOTO 850
830 IF CT=2 THEN ROT=160:CT=0
850 CT=CT+1:RETURN
860 IF CT=1 THEN ROT=128:GOTO 890
870 IF CT=2 THEN ROT=96:CT=0
890 CT=CT+1:RETURN
900 ? "↖":? " DO YOU WISH TO PLAY A RE
CORDED          MESSAGE (Y/N).";:INPUT S
T$
910 IF ST$(1,1)="N" THEN RETURN
920 IF ST$(1,1)<>"Y" THEN 900
925 TRAP 120
930 ? :? "WHAT IS LENGTH OF MESSAGE IN
 SECONDS":INPUT TIME:TIME=TIME/4:RETUR
N
1000 REM MODIFY DISPLAY LIST
1010 GOSUB 4000:POKE START+81,7:GOSUB
3000
1020 REM PRINT GREETING
1030 MEMST=PEEK(START)+PEEK(START+1)*2
56:CHRPOS=MEMST+3200
1035 RESTORE 1055
1040 FOR X=1 TO 14:READ MES:POKE CHRPO
S+X+2,MES:NEXT X:IF OUT=1 THEN 620
1055 DATA 168,225,176,240,185,64,226,1
69,242,180,232,164,225,185
1060 REM PRINT NAME
1070 Q=LEN(NAME$):Z=(20-Q)/2
1080 FOR I=1 TO Q:POKE CHRPOS+19+I+Z,A
SC(NAME$(I,I))+32:NEXT I
1090 POKE 87,7:RETURN
2000 REM MODIFY DISPLAY LIST
2010 GOSUB 4000:POKE START-1,71:POKE S
TART+2,7:POKE START+75,7
2015 POKE START+76,65:POKE START+77,PE
EK(560):POKE START+78,PEEK(561)
2020 POKE 87,2:POSITION 0,0:? #6;"
hApPy ";AGE;PRF$
2025 X=(20-LEN(DATE$))/2:POSITION X,1:
? #6;DATE$
2030 MEMST=PEEK(START)+PEEK(START+1)*2
56:CHRPOS=MEMST+2926
2035 RESTORE 2050
2040 FOR I=1 TO 8:READ MES:POKE CHRPOS
+I-1,MES:NEXT I
2050 DATA 226,169,242,180,232,164,225,
185
2055 REM PLAY TUNE
2056 READ AA,BB:SOUND 0,AA,10,10:POKE
20,0
2057 IF PEEK(20)<BB THEN 2057
2058 SOUND 0,0,0,0:IF AA>10 THEN 2056
2059 DATA 130,10,100,10,80,10,65,22,80
,10,65,33,5,0
2060 REM DRAW PRESENT
2065 POKE 87,7:POKE 765,1:COLOR 1
2070 PLOT 120,62:DRAWTO 120,20:DRAWTO
40,20:POSITION 40,62:GOSUB 100:COLOR 3
2075 FOR Y=20 TO 62:PLOT 80,Y:DRAWTO 9
0,Y:NEXT Y
2080 FOR X=40 TO 120:PLOT X,46:DRAWTO
X,36:NEXT X
2085 SETCOLOR 1,4,6:COLOR 2:Z=11:A=19
2090 FOR X=0 TO Z:PLOT 75+X,A:PLOT 95-
X,A:NEXT X
2100 Z=Z-2:A=A-1:IF Z>0 THEN 2090
2110 IF TIME>0 THEN GOSUB 8000:RETURN
2120 FOR I=1 TO 500:NEXT I:RETURN
3000 REM JUMP,ADDRESS AND LAST GR.2
3010 POKE START+82,7:POKE START+83,65:
POKE START+84,PEEK(560):POKE START+85,
PEEK(561):RETURN
4000 REM GR. AND START
4010 GRAPHICS 7+16:START=PEEK(560)+PEE
K(561)*256+4:RETURN
5000 PR=AGE-(INT(AGE/10)*10)
5010 IF PR=1 AND AGE<>11 THEN PRF$="St
":RETURN
5020 IF PR=2 AND AGE<>12 THEN PRF$="Nd
":RETURN
5030 IF PR=3 AND AGE<>13 THEN PRF$="Rd
":RETURN
5040 PRF$="Th":RETURN
6000 REM DRAW FACE
6010 COLOR 1:PLOT 33,12:DRAWTO 33,14:P
LOT 32,15:PLOT 32,16:DRAWTO 34,24:DRAW
TO 30,24:PLOT 32,25:DRAWTO 32,27
6020 COLOR 2:PLOT 28,27:PLOT 29,28:DRA
WTO 32,28:PLOT 32,27:PLOT 33,27:PLOT 3
2,29:PLOT 33,29
6030 COLOR 1:PLOT 32,30:DRAWTO 33,33:D
RAWTO 32,35:DRAWTO 20,35:DRAWTO 17,33:
PLOT 24,36:DRAWTO 24,46:PLOT 6,33
6035 PLOT 7,34:DRAWTO 7,41
6040 REM DRAW SHIRT/TOP
6050 COLOR 3:PLOT 2,56:DRAWTO 2,45:DRA
WTO 6,42:DRAWTO 27,48:DRAWTO 29,56
6060 IF SEX$(1,1)="M" THEN 6100
6070 REM DRAW HAIR & EYE-GIRL
6075 COLOR 0:PLOT 6,33:PLOT 7,34:DRAWT
O 7,36
6080 COLOR 3:PLOT 27,14:PLOT 28,14:PLO
T 29,13:PLOT 28,16:COLOR 2:PLOT 1,35:D
RAWTO 3,36
6090 DRAWTO 12,36:DRAWTO 19,22:DRAWTO
19,16:DRAWTO 25,11:DRAWTO 36,11:DRAWTO
 34,4:DRAWTO 5,4:DRAWTO 1,11
6095 DRAWTO 1,35:RETURN
6100 REM DRAW HAIR,EYE,AND EAR -BOY
6110 COLOR 2:PLOT 4,31:PLOT 5,32:DRAWT
O 10,32:DRAWTO 12,28:DRAWTO 12,17:DRAW
TO 18,17:DRAWTO 18,22:PLOT 19,22
```

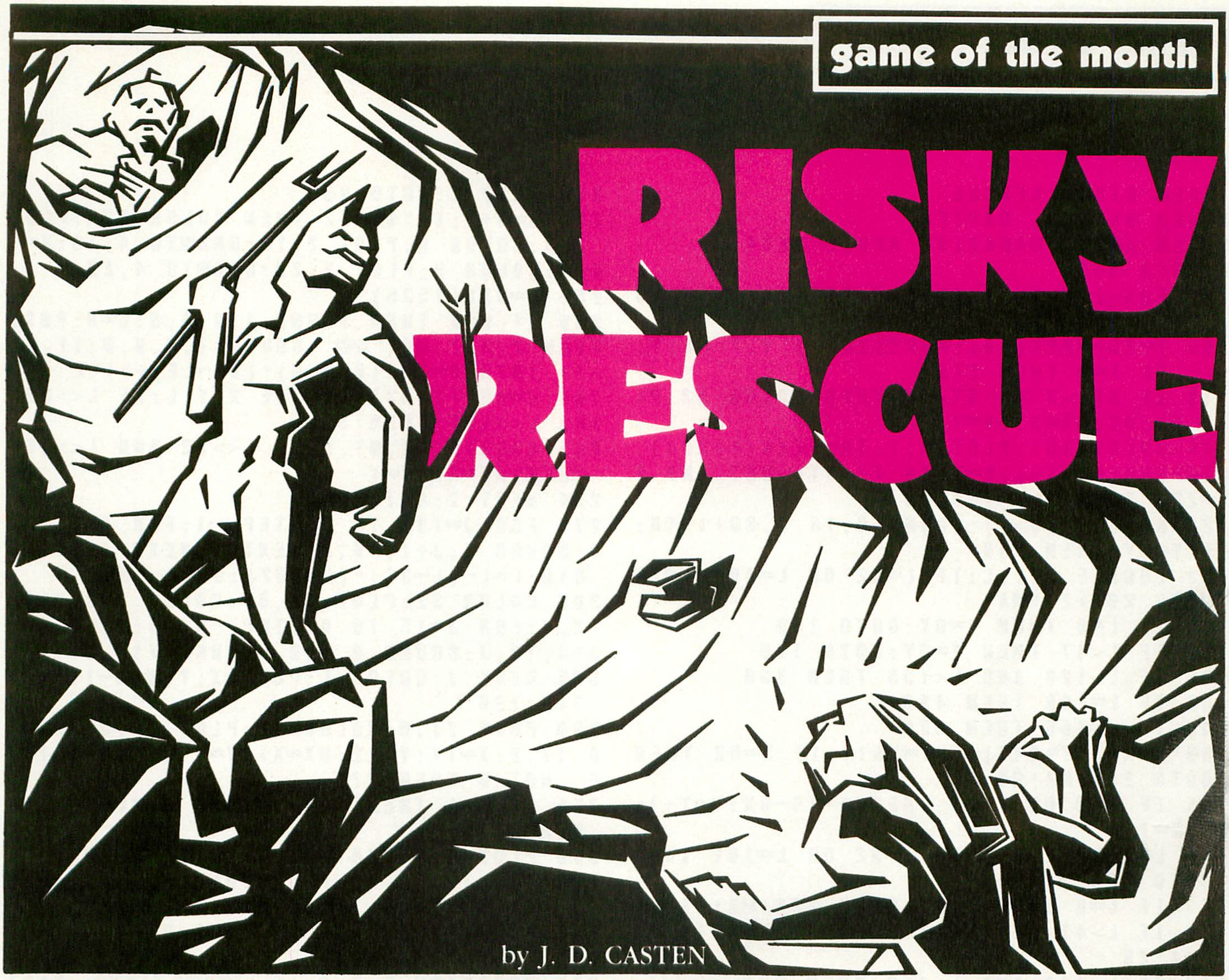
```
6115 DRAWTO 19,17:DRAWTO 25,11
6120 DRAWTO 33,11:DRAWTO 33,6:DRAWTO 2
9,4:DRAWTO 9,4:DRAWTO 3,10:DRAWTO 4,31
6130 COLOR 1:PLOT 16,24:DRAWTO 14,24:P
LOT 13,23:DRAWTO 13,18:PLOT 14,17:DRAW
TO 16,17:PLOT 17,18:PLOT 17,19
6140 COLOR 3:PLOT 16,21:PLOT 27,19:PLO
T 26,17:DRAWTO 30,17:RETURN
7000 REM TITLE PAGE
7010 GRAPHICS 2:SETCOLOR 2,0,0:SETCOLO
R 0,2,6:SETCOLOR 1,12,6:A=2:B=12:C=4:N
=0
7020 POSITION 8,1:? #6;"HapPy"
7030 POSITION 6,3:? #6;"BirThdAy"
7040 POSITION 6,5:? #6;"ComPutEr"
7050 POSITION 8,7:? #6;"CarD"
7060 POKE 752,1:? :? "by John Slaby"
7080 REM ROTATE COLORS
7090 FOR I=1 TO 40
7100 SETCOLOR 0,A,6:SETCOLOR 1,B,6:SET
COLOR 3,C,6:N=N+1:IF N>3 THEN N=1
7110 IF N=1 THEN A=12:B=4:C=2
7120 IF N=2 THEN A=4:B=2:C=12
7130 IF N=3 THEN A=2:B=12:C=4
7140 FOR J=1 TO 10:NEXT J:NEXT I:RETUR
N
8000 REM ALLOW CASSETTE TO PLAY MESSAG
E
8005 REM TIME IS IN UNITS OF 4 SECONDS
8010 POKE 19,0:POKE 54018,52
8020 IF TIME>PEEK(19) THEN 8020
8030 POKE 54018,60:RETURN
```

## TYPO TABLE

Variable checksum = 907689

| Line num range | | | Code | Length |
|---|---|---|---|---|
| 1 | — | 40 | NJ | 550 |
| 50 | — | 100 | KO | 524 |
| 110 | — | 320 | PG | 362 |
| 330 | — | 440 | MG | 437 |
| 450 | — | 620 | WE | 544 |
| 630 | — | 755 | RQ | 456 |
| 760 | — | 860 | NF | 414 |
| 870 | — | 1035 | CU | 427 |
| 1040 | — | 2025 | MN | 548 |
| 2030 | — | 2070 | RT | 506 |
| 2075 | — | 4010 | PW | 532 |
| 5000 | — | 6030 | JG | 626 |
| 6035 | — | 6090 | KH | 569 |
| 6095 | — | 6130 | XB | 520 |
| 6140 | — | 7100 | AK | 593 |
| 7110 | — | 8030 | LW | 348 |

# RISKY RESCUE



by J. D. CASTEN

In Risky Rescue, you can play the part of a creature named Igneous. Your archenemy, Greedo the goblin, has kidnapped your sweet baby Iggy and holds him captive in his creepy caves. He's put Iggy in a trance, and your only hope of rescuing the baby is to get medicine from three medicine pots and then touch him. To get medicine from a pot, land on it. Meanwhile, Greedo is throwing deadly arrows at you. The best way to avoid them is usually to move up and hover while they fly by. Sometimes, though, there's no room to maneuver, so you must use careful timing to get through the tight spots.

You control Igneous with a joystick. To move left or right, push the stick in that direction. If you go off the screen on one side, you'll reappear on the other. To move up, hold the fire button down and push the stick forward. Pressing the trigger turns on a mechanism that lets you hover at a constant altitude. If you push the stick forward, you are propelled upward. You need to push the stick each time you want to move up one space.




**SYNOPSIS**

*This exciting arcade game requires BASIC, a joystick, and 16K RAM (24K for a disk-based system). The program runs on all Atari computers.*

Once you've saved Iggy, you start another rescue in a new series of caves (the second screen). After the third screen, you start again on the first one, but Greedo throws his arrows at you even faster and harder than before. After each successful rescue, your score is increased (according to the level you're on and the amount of time remaining). If you fail to rescue Iggy before the timer runs out, you lose a player and the timer is reset. You start with three men, and you're awarded a new one at 50, 100, and 200 points, and so on. If you achieve a high score, you're asked to enter your initials at the game's end. The high score will be retained in memory even if you press [RESET].

continued on next page

## game of the month

```
1 REM RISKY RESCUE
2 REM BY J.D. CASTEN
3 REM ANTIC MAGAZINE APRIL 1984
5 GOTO 500
100 FOR Z=0 TO 1 STEP 0:OST=ST:IF Y=23
 THEN Y=22
105 T=25-PEEK(19):POSITION 1,1:? #6;T;
" ":IF T=0 THEN 275
110 IF OX<>X OR OY<>Y THEN COLOR 32:PL
OT OX,OY:OX=X:OY=Y
115 COLOR 162:PLOT X,Y:TR=PEEK(53264):
ST=PEEK(54016):Y=Y+TR:IF ST<>OST AND S
T=254 THEN Y=Y-1:SO=5
120 SO=SO-(SO>0):SOUND 0,18,8,SO+1-TR:
IF Y=OY THEN 150
123 LOCATE X,Y,L:IF L=32 OR L=162 THEN
 GOTO 200+25*MA
125 IF L=8 THEN Y=OY:GOTO 150
130 IF L<47 THEN Y=OY:GOTO 150
135 IF L>128 AND L<136 THEN 300
140 IF L=169 THEN 400
145 IF L=166 THEN 450
150 X=X+(ST=247)-(ST=251):IF X=OX THEN
 GOTO 200+MA*25
155 IF X<0 OR X=20 THEN X=19-OX:Y=Y+1-
2*(X=19)
160 LOCATE X,Y,L:IF L=32 OR L=162 THEN
 GOTO 200+MA*25+P
165 IF L=8 THEN X=OX:GOTO 200+MA*25
170 IF L>41 AND L<47 THEN X=OX:GOTO 20
0+MA*25
175 IF L>128 AND L<136 THEN 300
180 IF L=166 THEN 450
200 U=USR(1536):G=G+1:IF G=D/2 THEN CO
LOR 133:PLOT 2,7
205 IF G=D THEN SOUND 1,8,6,8:G=0:POSI
TION 2,7:? #6;"■■":SOUND 1,0,0,0:IF LE
>11 THEN D=INT(RND(0)*(26-LE)+1)*2
210 LOCATE X,Y,L:IF L<>32 AND L<>162 T
HEN 300
215 LOCATE OX,OY,L:IF L<>32 AND L<>162
 THEN OX=X:OY=Y
224 NEXT Z:GOTO 350
225 H=H+HP:COLOR 129:PLOT H,7:IF HP<0
THEN COLOR 32:PLOT H+1,7
227 IF H=4 OR H=13 THEN HP=-HP:SOUND 2
,75+HP*5,6,1
230 U=USR(1536):G=G+1:IF G=D/2 THEN CO
LOR 133:PLOT 2,5
233 IF G=D THEN SOUND 1,8,6,8:G=0:POSI
TION 2,5:? #6;"■■":SOUND 1,0,0,0:IF LE
>11 THEN D=INT(RND(0)*(26-LE)+1)*2
235 LOCATE X,Y,L:IF L<>32 AND L<>162 T
HEN 300
237 LOCATE OX,OY,L:IF L<>32 AND L<>162
 THEN OX=X:OY=Y
249 NEXT Z:GOTO 350
250 G=G+1:IF G=D/2 THEN COLOR 133:PLOT
 2,3:COLOR H:PLOT 2,16:DRAWTO 4,16:H=4
0-H:COLOR H:PLOT 2,20:DRAWTO 4,20
253 U=USR(1536)
255 IF G=D THEN SOUND 1,8,6,8:G=0:POSI
TION 2,3:? #6;"■■":SOUND 1,0,0,0:IF LE
>11 THEN D=INT(RND(0)*(26-LE)+1)*2
260 U=USR(1663):LOCATE X,Y,L:IF L<>32
AND L<>162 THEN 300
265 LOCATE OX,OY,L:IF L<>32 AND L<>162
 THEN OX=X:OY=Y
274 NEXT Z:GOTO 350
275 FOR J=100 TO 0 STEP -1:FOR I=0 TO
3:SOUND I,J+I,10,8:NEXT I:NEXT J:GOSUB
 810:L=L-(L-32)*(L=162):GOTO 300
300 COLOR 32:PLOT OX,OY:COLOR 162:PLOT
 X,Y:FOR J=15 TO 0 STEP -0.25:SOUND 0,
J+J,10,J:SOUND 0,0,0,0:POKE 710,J+192
305 NEXT J:COLOR L:PLOT X,Y:W=W-1:POKE
 710,196
350 POKE 77,0:COLOR 32:PLOT 19,0:DRAWT
O 17,0:X=17:Y=22:OX=X:OY=Y:COLOR 162:I
F  NOT W THEN 375
355 IF W>1 THEN FOR J=2 TO W:PLOT J+15
,0:NEXT J
360 PLOT X,Y:FOR I=0.5 TO 15 STEP 0.5:
FOR J=0 TO 15 STEP I:SOUND 0,J*10,0,15
-J:NEXT J:POKE 710,I+192:NEXT I
365 GOSUB 810:POKE 710,196:POKE 19,0:P
OKE 20,0:GOTO 100
375 POSITION 5,7:? #6;"GAME OVER":POSI
TION 3,13:? #6;"press trigger"
380 GOSUB 810:IF PEEK(53264)=0 THEN 38
0
385 IF PEEK(53264)=1 THEN 385
390 GOTO 550
400 FOR J=60 TO 0 STEP -1:SOUND 0,J+60
,10,15-J/4:POKE 53760,J:NEXT J:GOSUB 8
10:COLOR 8:PLOT X,Y:Y=OY:M=M+1:NEXT Z
450 IF M<3 THEN X=OX:Y=OY:FOR J=15 TO
0 STEP -1:SOUND 0,10,6,J:NEXT J:NEXT Z
455 SC=SC+T*LE:LE=LE+1:MA=MA+1:POSITIO
N 12,1:? #6;SC:IF MA=3 THEN MA=0:D=D-4
:G=D-1:IF D<10 THEN D=10
460 IF SC>=B AND W<4 THEN B=B*2:W=W+1:
FOR H=1 TO 5:FOR J=15 TO 0 STEP -1:SOU
ND 0,20,10,J:NEXT J:NEXT H:GOTO 460
465 RESTORE 2000:FOR J=0 TO 61:FOR V=0
 TO 3:READ N:SOUND V,N,10,6:NEXT V:FOR
 T=0 TO 12:NEXT T:NEXT J
470 FOR J=165 TO 160 STEP -0.5:FOR I=5
3761 TO 53767 STEP 2:POKE I,J:NEXT I:N
EXT J:GOTO 600
500 GRAPHICS 17:POKE 559,0:U=USR(ADR("
h)♥¬K¬M)♦¬L%ji¬¬N"L ♥1K⌐M◢PyfLfNJPp●")
```

```
):A=PEEK(106)-6
505 FOR J=A*256+8 TO A*256+119:READ B:
POKE J,B:NEXT J:COM HN$(3),D$(12):H=PE
EK(89)-1:FOR J=1536 TO 1710:READ B
510 POKE J,B+H*(B=1 OR B=2):NEXT J:HS=
PEEK(1790)+256*PEEK(1791):FOR J=1 TO 3
:HN$(J)=CHR$(PEEK(J+1786)):NEXT J
515 POKE 756,A:H=PEEK(560)+256*PEEK(56
1):POKE H+6,134:POKE 512,167:POKE 513,
6:POKE 54286,192:POKE 559,34
550 GOSUB 810:? #6;"▛":POKE 708,10:POK
E 709,150:POKE 710,196:POKE 711,52:IF
SC>HS THEN HS=SC:GOSUB 850
555 G=19:MA=0:W=3:D=20:SC=0:LE=1:B=50:
? #6;"▜":? #6;"▞—*. * —*. — — — .":? #
6;"+* * * * * * *"
560 ? #6;" **, * +*. **. +*,":? #6;" *
 . * * * * *":? #6;" * * * +*, * *
 *"
565 ? #6:? #6;"—*. —. —*. —. — . —.* *
 * * * * * * ** ** +*. * * * ***
 . * * * * * *"
570 ? #6;"* * +, +*, +, +*, +,":? #6;"
 by jd casten"
575 IF HS THEN ? #6:? #6;" HIGH SCORE:
";HN$;" ";HS:POKE 1791,INT(HS/256):POK
E 1790,HS-256*PEEK(1791)
580 ? #6:? #6;" press trigger":? #6;
" to play";
585 U=USR(1536):FOR I=0 TO 3:G=G+1:IF
G=D/2 THEN COLOR 133:PLOT 0,1
586 IF G=D THEN SOUND 1,8,6,8:G=0:POSI
TION 0,1:? #6;"▀▚":SOUND 1,0,0,0
595 IF PEEK(53264)=1 THEN NEXT I:GOTO
585
600 POP :GOSUB 810:? #6;"▛TIME LEVEL S
CORE":? #6;" 25":POSITION 6,1:? #6;LE:
POSITION 12,1:? #6;SC:GOSUB 610+MA*50
605 M=0:X=17:Y=22:FOR Z=0 TO 75:SOUND
3,5,10,10:SOUND 3,0,0,0:GOTO 200+MA*25
610 ? #6;"—****************.*& *
 * *+▟▟. *▐▟▟**. —*, * * +
*.* +.—, *—**, +, +*, —*,";
615 ? #6;"*▚ * *▚▛—**▟▟
▟▟*. +*.***, * ****. *, *
▐▟▟. * * +**** * +**▟▟";
620 ? #6;"▟▟*. +▟▟▟, +, *":?
#6;" +***.":? #6;" +***.—*.—**
***. +, +,"
625 ? #6;" +***.":? #6;" +****▟▟▟▟
▟▟▟. * * —▟▟▐*
 +****. +, +, —***. *";
630 ? #6;" * * * +*▟▟▟▟
▟▟▟*. —*▟▟▟,";:G=D-1:RETURN
660 ? #6;"—*****.—**********. *& **
 +*.*▟▟*, +, +*****. **▚▛
 +*, **▚▛—*. *";
665 ? #6;"****▛▛▛▛▛▛▛▛▛▛**▐▟▟*******
 * +, +, +, * * *
 *—*.—******, * +, +, *";
670 ? #6;"* ** —***▟▟
▟▟▟▟*****, ***, *—*.—*.* * +, +
, +, +, * +.—*";
675 ? #6;".—*.—**.—*****. +, +, +, +
, * * * * +**********.
 * ** +**, +******, *";
680 ? #6;"+▐▟. * * +****
*. —▟▟▐*▟▟▟,";:H=4:HP=1:G=D-1:RETURN
710 ? #6;"—*****************.*▚▛
 * * **▚▛—***, *▐▟. * —▟▐****,
 +*** * +**** * *"
715 ? #6;"▛▛▛▛ ▛▛▛▛▛▛ ▛▛* *
 * &** * +▟▟▟▟*, +**,
":? #6;" +*.—*.—*.";
720 ? #6;"▟▟▟***. +, +, +, *"
:? #6;" +*.—*.—.—*.—**. +,
+,+, +, ***▟▟▟. *";
725 ? #6;"* +*.—**.—****, *, +
, +, * *******▟▟▟.
—.—.—.—, * +,+,+,+, * —";
730 ? #6;". * *+*******
*▟▐▟*. *▟▟▟,";:G=0:H=8:RETURN
810 FOR J=0 TO 3:SOUND J,0,0,0:NEXT J:
RETURN
850 ? #6;"▛":? #6;" the score of the"
:? #6;"game you just played is highe
st yet":? #6
855 ? #6;" please enter three":? #6;"
 initials▙___":POSITION 13,6:OPEN #1
,4,0,"K":POKE 764,255
860 FOR J=1 TO 3:GET #1,K:? #6;CHR$(K)
;:POKE 1786+J,K:HN$(J)=CHR$(K):NEXT J:
CLOSE #1:GOTO 550
900 DATA 255,60,36,231,36,60,255,0,186
,214,124,16,16,124,254,198,188,250,127
,112,60,120,251,254,251,120,124,62,54
905 DATA 246,103,197,61,95,254,14,60,3
0,223,127,0,0,9,6,9,6,15,9,0,0,196,102
,127,102,196,0,255,128,65,34,20,8,255
910 DATA 0,255,126,255,231,195,231,255
,126,255,191,255,251,223,255,255,117,2
55,111,59,127,30,29,7,0,255,247,126
915 DATA 220,180,248,232,128,3,7,30,47
,59,119,95,250,192,240,124,248,190,250
,119,251
1000 DATA 104,160,255,185,127,2,201,19
9,240,14,76,18,6,169,0,153,127,2,136,2
08,238,76,65,6,185,147,2,201,0,240,26
1005 DATA 201,130,240,22,185,128,2,201
,0,240,7,201,130,240,3,76,13,6,169,199
,153,128,2,76,13,6,169,199,153,147,2
```

continued on next page

## game of the month

```
1010 DATA 76,13,6,160,255,185,128,1,20
1,199,240,12,76,82,6,169,0,153,128,1,1
36,208,238,96,185,148,1,201,0,240,26
1015 DATA 201,130,240,22,185,129,1,201
,0,240,7,201,130,240,3,76,77,6,169,199
,153,129,1,76,77,6,169,199,153,148,1
1020 DATA 76,77,6,104,160,0,185,12,2,1
70,169,0,153,12,2,200,192,20,208,5,138
,153,11,2,96,185,12,2,201,193,208,8
1025 DATA 153,11,2,169,0,153,12,2,76,1
39,6,72,169,242,141,22,208,104,64
2000 DATA 60,96,162,193,60,96,162,193,
53,0,0,0,53,0,0,0,60,96,162,193,60,96,
162,193,64,0,0,0,64,0,0,0,64,96,121
2005 DATA 144,64,96,121,144,60,96,121,
144,60,96,121,144,72,96,121,144,72,96,
121,144,72,96,121,144,72,96,121,144
2010 DATA 72,91,217,0,72,91,217,0,72,9
1,144,0,72,91,144,0,72,91,121,0,72,91,
121,0,72,0,0,0,81,0,0,0,72,91,128,162
2015 DATA 72,91,128,162,81,0,128,162,8
1,0,128,162,0,0,144,0,0,0,144,0,0,0,16
2,0,0,0,162,0,60,96,162,193,60,96,162
2020 DATA 193,64,0,0,0,72,0,0,0,64,0,0
,0,72,0,0,0,81,0,0,0,81,0,0,0,72,96,24
3,0,72,96,243,0,0,96,162,0,0,96,162,0
2025 DATA 81,0,243,0,72,0,243,0,60,96,
162,0,60,96,162,0,72,96,243,0,72,96,24
3,0,72,96,144,0,72,96,162,0,72,96,243
2030 DATA 0,72,96,243,0,72,96,144,0,72
,96,162,0,72,96,243,0,72,96,243,0,0,0,
144,0,0,0,162,0,0,0,243,0,0,0,243,0
```

### TYPO TABLE

Variable checksum = 388847

| Line num range | | | Code | Length |
|---|---|---|---|---|
| 1 | — | 125 | XE | 521 |
| 130 | — | 200 | VD | 519 |
| 205 | — | 230 | QR | 509 |
| 233 | — | 255 | JG | 636 |
| 260 | — | 350 | OQ | 569 |
| 355 | — | 400 | MZ | 575 |
| 450 | — | 470 | MU | 577 |
| 500 | — | 550 | QF | 612 |
| 555 | — | 575 | TH | 543 |
| 580 | — | 605 | RF | 620 |
| 610 | — | 630 | XJ | 542 |
| 660 | — | 680 | LI | 571 |
| 710 | — | 730 | VN | 552 |
| 810 | — | 900 | CW | 517 |
| 905 | — | 1005 | MH | 516 |
| 1010 | — | 2005 | HU | 604 |
| 2010 | — | 2030 | LP | 543 |

# CHART YOUR PROGRESS

## SPECIALS OF THE MONTH

| | |
|---|---|
| Atari 600XL | $189 |
| Atari 800XL | $299 |
| Atari 1050 Disk Drive | $399 |
| Atari 1030 Modem | $115 |
| 1027 Letter Quality Printer | $299 |
| 1025 80 Column Printer | $329 |
| Rana 1000 Disk Drive | $329 |
| Percom S/S Disk Drive w/printer port | $519 |
| Elephant Disks S/S | $19.50 |
| Verbatim Twin Pak S/D | $ 5.25 |

## HARDWARE SPECIALS

### Printers

| | |
|---|---|
| Leading Edge Gorilla | $189 |
| NEC 8023A | $459 |
| Okidata ML 82A | Call |
| Okidata ML 83A | Call |
| Okidata ML 84P | Call |
| Okidata ML 92P | Call |
| C. ITOH 8510 Prowriter | $399 |
| C. ITOH 8510 SP | $665 |
| Mannesmann Tally 160L | $629 |
| Gemini 10X | $315 |
| Mannesmann Tally Spirit | $345 |
| Alphacom 81 | $189 |

### Monitors

| | |
|---|---|
| Leading Edge Green Hi-Res 12" | $ 89 |
| USI Amber | $169 |
| NEC Green Screen | $169 |
| Leading Edge Amber Hi-Res 12" | $ 89 |
| Amdek Color 1+ | $315 |

## RECREATION

| | |
|---|---|
| Q Bert/CRT | $ 35 |
| Frogger/CRT | $ 35 |
| Popeye/CRT | $ 35 |
| Deadline | $ 35 |
| Zork I, II, III ea. | $ 27 |
| Witness | $ 35 |
| Planetfall | $ 35 |
| Enchanter | $ 35 |
| Infidel | $ 35 |
| Temple of Apshai | $ 27 |
| Pitstop | $ 27 |
| Starleague Baseball | $ 23 |
| Starleague Football | $ 23 |
| Blue Max | $ 23 |
| Joust | $ 43 |
| Robotron 2084 | $ 33 |
| Pole Position | $ 36 |
| Ms. Pac Man | $ 36 |
| B-1 Nuclear Bomber (C) | $ 12 |
| Midway Campaign (C) | $ 12 |
| Nukewar (C) | $ 12 |
| Telengard (C) | $ 16 |
| Jumpman Jr./CRT | $ 27 |
| Pitstop/CRT | $ 27 |
| Flight Simulator II/D | $ 39 |
| Night Mission Pinball | $ 20 |
| Sammy Light Foot (CRT) | $ 20 |
| Apple Cider Spider | $ 23 |

## EDUCATION

| | |
|---|---|
| Harcourt Brace SAT/D | $59 |
| Chaterbee/D | $29 |
| Match Wits/D | $22 |
| Early Games/D | $22 |
| Early Games Music/D | $22 |
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| Meteor Multiplication | $25 |
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| Spider Eater/Koala | $22 |
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| Success with Math Mult.-Div. | $ 15 |
| Success with Math Fractions | $ 20 |
| Success with Math Decimals | $ 20 |
| Ernie's Magic Shapes CRT | $ 29 |
| Big Bird Special Delivery | $ 29 |
| PLATO French Vocab. Builder | $ 30 |
| PLATO Spanish Vocab. Builder | $ 30 |
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| PLATO Whole Numbers | $ 30 |
| PLATO Decimals | $ 30 |
| PLATO Fractions | $ 30 |
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| PDI Pre-school Library/cass | $ 49 |
| PDI Let's Spell | $ 17 |
| Aerobics/D | $ 35 |
| Trains/D | $ 29 |
| Up for Grabs/CRT | $ 29 |
| Cosmic Life/CRT | $ 25 |
| Delta Music/CRT | $ 29 |

## BUSINESS

| | |
|---|---|
| Atariwriter | $ 79 |
| Visicalc | $179 |
| Financial Wizard | $ 45 |
| Letter Perfect | $ 69 |
| Data Perfect | $ 79 |
| Spell Perfect | $ 65 |
| Spell Wizard | $ 45 |
| Text/Spell Wizard Combo | $ 65 |
| Bank Street Writer | $ 49 |
| Bank Street Speller | $ 49 |
| Homeword | $ 49 |
| Syn File + | $ 65 |
| Syn Text | $ 23 |
| Syn Mail | $ 34 |
| Home Accountant | $ 48 |
| Tax Advantage | $ 39 |
| Complete Personal Accountant | $ 65 |
| Atspeller | $ 33 |
| Diskette Mailing List | $ 21 |
| Miles Payroll System | $119 |
| Atari Accounting | $169 |
| Family Finance | $ 36 |
| File Manager 800+ | $ 65 |
| Bookkeeper | $105 |
| MAC 65 W/OS A+ | $ 59 |
| BASIC XL | $ 72 |
| BUG/65 w/OS A+ | $ 25 |

### Peripherals

| | |
|---|---|
| Alien Voice Box | $ 99 |
| Bit 3 80 column board | $269 |
| Microtek 16K RAM | $ 74 |
| Mosaic 64K (400) | $149 |
| RAM POWER 128K | $369 |
| Versa Writer tablet | $219 |
| KOALA TOUCH TABLET | $ 72 |
| CHALKBOARD POWER PAD/w cable | $ 85 |

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# UPDATE DISKS WITH NOTE AND POINT

by JERRY WHITE

## SYNOPSIS

*This article shows how to use NOTE and POINT to update data files on disk. The program requires BASIC and a disk drive, and works on all Atari computers. You also must use a data file generated by the TELEPHON program (ANTIC, Phone Book, February 1984).*

Atari DOS organizes data into sectors, each of which contains 128 bytes. Sometimes, when using data files, we want to access a record directly, without having to go through the time-consuming process of checking each record in the file in sequence. Using NOTE and POINT, you can perform what is known as random-access updating.

To use NOTE and POINT, you must first open a file (usually a data file). If you want to determine the file's physical location on the disk, use NOTE X,Y. This returns the current sector number in X, and the current byte within that sector in Y. Use POINT to point to a particular location in a sector, also with values for sector and byte. The location that is POINTed to must be within the OPENed file's bounds.

### USING "TELEPHON" DATA FILES

This is somewhat different from the method used in the TELEPHON program (ANTIC, Phone Book, February 1984), where we altered records by updating a string in memory. The TELEPHON program stores all of your data temporarily in RAM. Random-access updating allows you to alter data directly on the diskette, as long as you don't change the size of your data file.

In response to reader requests, this article and program demonstrate how to use the NOTE and POINT instructions. To use the UPDATE program, you need a data file generated by the TELEPHON program from the February 1984 issue of ANTIC.

A few words of caution are in order. It is possible to damage your data file if you enter the UPDATE program incorrectly. Before using this program, format a disk and use DOS option "O" to duplicate your "TELEPHON.DAT" file onto the newly formatted diskette. If anything goes wrong, you can always make another duplicate from your original.

### THE UPDATING PROCESS

We begin by opening our data file as shown in line 720. Notice the auxiliary byte 12 in the OPEN command. If it were an eight, we could only write and create a new file. The number 12 allows us to read and write.

The routine that begins at line 210 reads your data file and creates an index by storing the starting location of each record in two arrays. The variable RECS is used as a record counter. Before we input each record, we note its current location and store the sector and byte numbers in the variables SEC and BYT. We then INPUT each record, and display the record number, disk location and record data on the screen. We also store the sector and byte locations in the index arrays. Once the data has been indexed in this way, we can alter as many records as needed without rereading the entire data file, and without reading the entire data file into RAM.

Since we now know where each record begins, we can simply point to the desired record on disk, and then read it into a string (REC$), as shown in line 330. We next make the necessary changes using string manipulation, and create an updated record in the string called WORK$. When we're ready to write our updated information back onto the disk, we simply point back to the original record position as shown in line 550, write the data onto the disk as shown in line 560, close the file, and then reopen it for our next update.

### FURTHER NOTES

There are more sophisticated methods of random-access

updating, but this one is the easiest to understand. To use it, you must know the record numbers of each record you wish to update. Therefore, it is very important that you make a note of each record number to be changed. You can do this as the program creates its index and displays the necessary information on the screen. To stop the scrolling and give yourself time to write down the desired record numbers, press [CTRL] and [1] simultaneously. To continue, just press [CTRL] and [1] again.

If you still don't understand how the program works, study the program listing. When you read a BASIC program listing, it helps to know the meaning of each variable name. Meaningful variable names are helpful, but a few words of definition also can make a big difference.

Chart 1 lists all variables used in the UPDATE program and briefly describes each of them. To make these descriptions easy to find, the variables are listed alphabetically. String names are followed by a dollar sign; array names are followed by an open parenthesis character. All other names are numeric variables.

Chart 1
**UPDATE Variable Descriptions**

| | |
|---|---|
| AREA$ | area code |
| BYT | byte number within sector |
| BYT( | byte-number array |
| EXCH$ | telephone exchange |
| FIRST$ | first name |
| INLEN | length of string |
| LAST$ | last name |
| PNUM$ | last four digits of phone number |
| REC$ | record data read from disk |
| RECS | record-number counter |
| RNUM | record number to update |
| SEC | sector number |
| SEC( | sector-number array |
| USER$ | user's input from keyboard |
| WORK$ | work string for record update |

*Jerry White is an institution in the world of Atari computing, and a long-time ANTIC Contributing Editor. This month's column inaugurates "The Tool Box," a new department that will focus on utility programs written in BASIC or for use with BASIC. Jerry will cover other topics on an intermittent basis.*

```
100 REM NOTE & POINT DISK UPDATE
110 REM BY JERRY WHITE
115 REM ANTIC MAGAZINE
120 REM This program demonstrates
130 REM random access disk updating
140 REM using NOTE and POINT.
160 GOTO 600
180 REM READ TELEPHON.DAT AND CREATE
190 REM SECTOR/BYTE LOCATION ARRAYS
210 RECS=RECS+1:NOTE #1,SEC,BYT
220 INPUT #1,REC$:? :? "RECORD ";RECS;
230 ? "  SECTOR ";SEC;"  BYTE ";BYT:? REC$
240 SEC(RECS)=SEC:BYT(RECS)=BYT:GOTO 210
250 RECS=RECS-1:POKE 752,0
270 REM UPDATE LOOP
290 TRAP 290:? :? "  ENTER RECORD NUMBER TO UPDATE OR"
300 ? "  TYPE 0 AND RETURN TO QUIT";:INPUT RNUM
310 RNUM=INT(RNUM):IF  NOT RNUM THEN 590
320 IF RNUM<1 OR RNUM>RECS THEN ? CHR$(125):? "  ENTER A NUMBER FROM 1 TO ";RECS:GOTO 290
330 POINT #1,SEC(RNUM),BYT(RNUM):INPUT #1,REC$
340 LAST$=REC$(1,12):FIRST$=REC$(13,24)
350 AREA$=REC$(25,27):EXCH$=REC$(28,30)
360 PNUM$=REC$(31,34):? CHR$(125)
370 ? "ENTER UPDATED INFORMATION OR JUST"
380 ? "PRESS RETURN TO LEAVE ITEM UNCHANGED"
390 WORK$=" ":WORK$(34)=" ":WORK$(2)=WORK$
400 ? :? "LAST NAME: ";LAST$:INPUT USER$
410 INLEN=LEN(LAST$):IF  NOT INLEN THEN WORK$(1,12)=REC$(1,12):GOTO 430
420 WORK$(1,INLEN)=USER$
430 ? :? "FIRST NAME: ";FIRST$:INPUT USER$
440 INLEN=LEN(FIRST$):IF  NOT INLEN THEN WORK$(13,24)=REC$(13,24):GOTO 460
450 WORK$(13,12+INLEN)=USER$
460 ? :? "AREA CODE: ";AREA$:INPUT USER$
470 INLEN=LEN(AREA$):IF  NOT INLEN THEN WORK$(25,27)=REC$(25,27):GOTO 490
480 WORK$(25,24+INLEN)=USER$
490 ? :? "EXCHANGE: ";EXCH$:INPUT USER
```

continued on next page

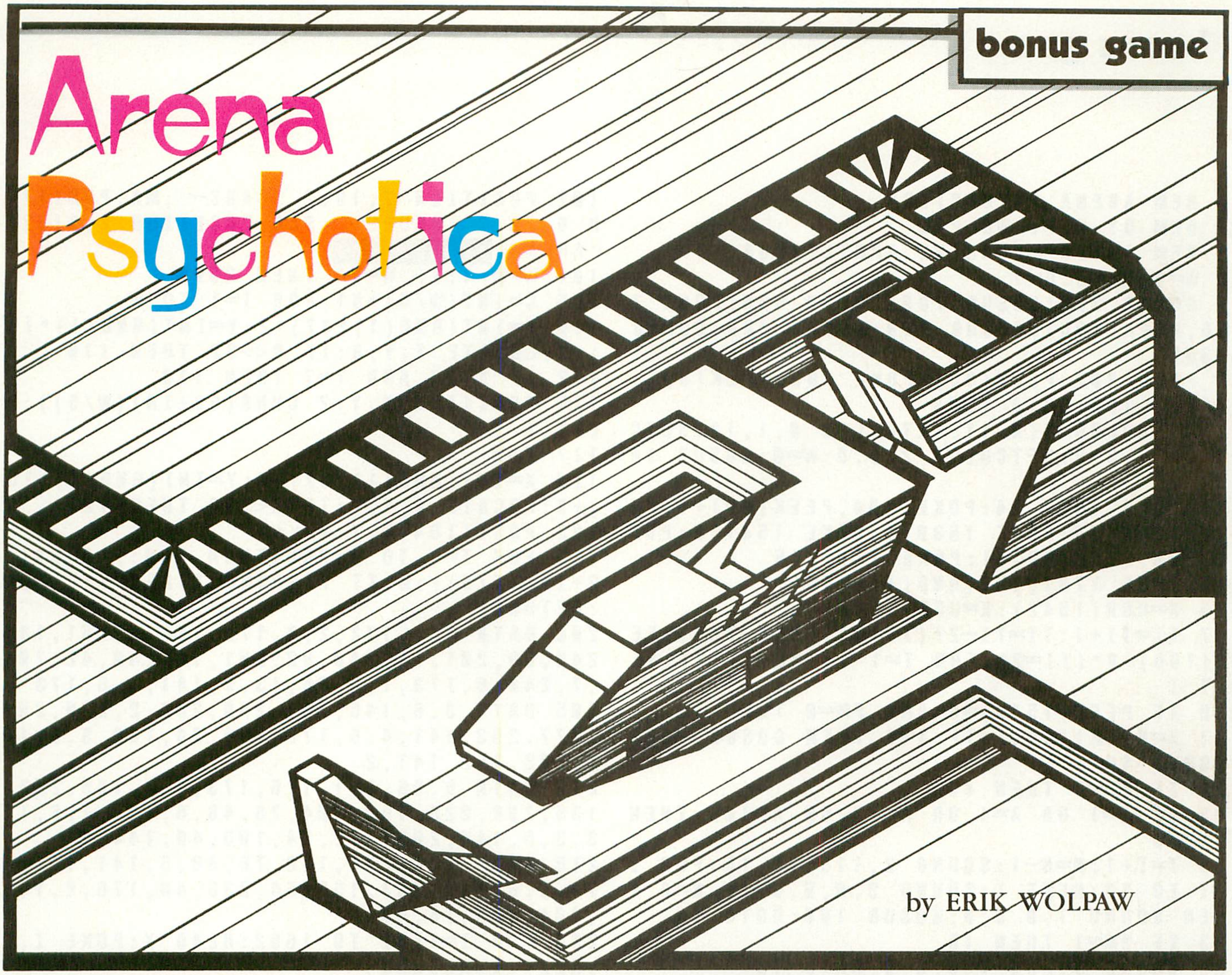
```
$
500 INLEN=LEN(EXCH$):IF  NOT INLEN THE
N WORK$(28,30)=REC$(28,30):GOTO 520
510 WORK$(28,27+INLEN)=USER$
520 ? :? "NUMBER: ";PNUM$:INPUT USER$
530 INLEN=LEN(PNUM$):IF  NOT INLEN THE
N WORK$(31,34)=REC$(31,34):GOTO 550
540 WORK$(31,30+INLEN)=USER$
550 POINT #1,SEC(RNUM),BYT(RNUM)
560 PRINT #1;WORK$
570 CLOSE #1:OPEN #1,12,0,"D:TELEPHON.
DAT"
580 GOTO 290
590 GRAPHICS 0:? :? "BASIC":? "IS";:CL
OSE #1:END
610 REM PROGRAM INITIALIZATION
630 DIM LAST$(12),FIRST$(12),AREA$(3),
EXCH$(3),PNUM$(4),REC$(34),WORK$(34)
640 DIM SEC(500),BYT(500),USER$(12)
650 GRAPHICS 0:POKE 82,2:POKE 83,39:PO
KE 752,1:POKE 710,160
660 REM DISABLE BREAK KEY
670 POKE 16,64:POKE 53774,112
680 ? :? "  TELEPHON.DAT RANDOM ACCESS
UPDATE"
690 ? :? "    INSERT TELEPHON.DAT DISK
THEN"
700 ? :? "        PRESS START WHEN READY
":?
710 POKE 755,2:IF PEEK(53279)<>6 THEN
POKE 755,3:GOTO 710
720 TRAP 650:CLOSE #1:OPEN #1,12,0,"D:
TELEPHON.DAT"
730 RECS=0:? CHR$(125):TRAP 250:GOTO 2
10
```

## TYPO TABLE

Variable checksum = 494212

| Line num range | Code | Length |
|---|---|---|
| 100 – 230 | CB | 341 |
| 240 – 370 | EI | 494 |
| 380 – 490 | PU | 476 |
| 500 – 630 | VN | 484 |
| 640 – 730 | SU | 501 |

# Arena Psychotica



by ERIK WOLPAW

The opening screen of this game says "Game Over." To play, just plug a joystick into Port 1 and press the fire button.

In Arena Psychotica, your player is the driver of a small race car, which is controlled by the joystick. Your object is to clear as many waves as possible. To clear a wave, pick up all the prizes that are scattered about the arena by running your car over them. Each time you pick up a prize, your car's speed increases. Meanwhile, a monster moves about the arena at random, leaving a deadly, checkered trail. If you touch the monster, his trail, or your own trail with your car, you lose a life.

Each wave contains one yellow dot, or energizer. If you hit the energizer, you'll turn briefly into a Gobbler. While you're in this powerful form, you can eat your way through the monster's trail, as well as your own. You receive one point for each piece of trail that you ingest. When you hear the tone change in pitch, it means that your energy quotient is almost used up, and that you'll return to your original form shortly.

For each 100 points you score, you'll receive an extra car. At the start of each new wave, an additional prize is added to the total you must pick up. And every fifth wave, a new type of prize is offered. The game ends after the completion of 24 waves. To restart, press the joystick button.




## SYNOPSIS

*This very challenging arcade game pits you, as a race car driver, against a monster that leaves a deadly trail behind it. The program runs on all Atari computers, and requires 16K (24K for disk) and BASIC.*

*Erik Wolpaw is a junior at Cleveland Heights High School in Cleveland, Ohio. ANTIC published an earlier game of Erik's, Air Raid 2000, in November of 1983.*

continued on next page

```
0 REM ARENA PSYCHOTICA
1 REM BY E.F. WOLPAW
2 REM ANTIC MAGAZINE APRIL 1984
3 W=0:MA=3:D=1
5 GOSUB 200:GOSUB 700:GOSUB 600:POKE 7
56,PEEK(106):GOSUB 800:GOSUB 400:GOSUB
 300
6 POKE 207,PEEK(88):POKE 208,PEEK(89):
GOSUB 100:GOTO 1500
7 SETCOLOR 4,0,11:SETCOLOR 0,1,12:SETC
OLOR 1,3,8:SETCOLOR 2,0,0:W=0:GOSUB 10
0
10 POKE 1537,14:POKE 204,PEEK(89)+1:PO
KE 1538,75:POKE 1539,1:POKE 1541,0:POK
E 208,PEEK(89)+1:POKE 1791,10
12 POKE 1791,INT(RND(1)*255)+1
15 X=USR(1542):X=USR(1684)
17 TI=TI+1:TI=TI-2*(TI=3):POKE 756,PEE
K(106)+8*(TI=2):FOR I=1 TO 50-(T*3):NE
XT I
20 IF PEEK(1540)=0 AND PM=0 THEN 15
21 A=PEEK(1540):IF A=3 THEN GOSUB 3000
:GOTO 40
22 IF PM=1 THEN 45
25 IF A=1 OR A=4 OR A=17 OR A=100 THEN
 1000
30 T=T+1:N=N-1:SOUND 2,115,10,15:FOR I
=1 TO 30:NEXT I:SOUND 2,0,0,0:IF N=0 T
HEN SOUND 1,0,0,0:GOSUB 100:GOTO 10
33 IF PM=1 THEN 15
35 SOUND 1,250-T*6,6,6:GOTO 15
40 POKE 1541,5:SOUND 1,0,0,0:PM=1:PT=3
0:POKE 1539,0:GOTO 15
42 IF A<19 OR A>25 THEN 15
45 PT=PT-1:IF PT<0 THEN POKE 1541,0:PM
=0:POKE 1539,1:SOUND 2,0,0,0:GOTO 35
46 D=D*(-1):SOUND 2,100+(D*20)+40*(PT<
6),10,4
48 PE=PEEK(1540):IF PE=0 OR PE=1 OR PE
=100 THEN 65
54 IF PE>19 AND PE<25 THEN 30
55 IF PE=17 OR PE=4 THEN 1000
60 GOTO 15
65 IF PE=0 THEN 15
66 IF PE=100 THEN PT=PT-5
67 SCO=SCO+1:IF SCO/100=INT(SCO/100) T
HEN GOSUB 2500:MA=MA+1:POSITION 7,19:?
 "CARS-";MA
69 POSITION 6,20:? "SCORE-";SCO
72 GOTO 15
95 REM NEXT LINE HAS 42 SPACES
100 FOR I=0 TO 22:POSITION 0,I:? "                                          ";
:NEXT I:SOUND 2,0,0,0:GOSUB 300
101 POKE 752,20:T=0:POKE 1541,0:PM=0:P
OKE 1539,1
102 POSITION 7,19:? "CARS-";MA:POSITIO
N 6,20:? "SCORE-";SCO:POSITION 2,21:?
"ARENA psychotica"
104 W=W+1:IF W=24 THEN 2000
105 C=INT(W/5)+51:FOR I=1 TO W
110 X=INT(RND(1)*37)+2:Y=INT(RND(1)*16
)+3:LOCATE X,Y,R:IF R<>32 THEN 110
112 IF X=27 AND Y=7 THEN 110
115 POSITION X,Y:? CHR$(52+INT(W/5)):N
EXT I
117 N=W
120 X=INT(RND(1)*37)+2:Y=INT(RND(1)*16
)+3:LOCATE X,Y,R:IF R<>32 THEN 120
122 POSITION X,Y:? "#"
125 FOR I=1 TO W:POSITION I,0:? CHR$(5
2+INT(I/5)):NEXT I:SOUND 1,250-T*6,6,6
:RETURN
200 DATA 104,172,2,6,173,120,2,201,13,
240,66,201,14,240,82,201,11,240,42,201
,7,240,6,173,1,6,76,13,6,141,1,6,173
205 DATA 3,6,145,203,200,208,2,230,204
,177,203,141,4,6,173,1,6,24,109,5,6,14
5,203,152,141,2
210 DATA 6,96,141,1,6,173,3,6,145,203,
136,208,226,198,204,76,48,6,141,1,6,17
3,3,6,145,203,152,24,105,40,144,2
215 DATA 230,204,168,76,48,6,141,1,6,1
73,3,6,145,203,152,56,233,40,176,2,198
,204,168,76,48,6
220 FOR I=1542 TO 1662:READ X:POKE I,X
:NEXT I:RETURN
300 POKE 559,34
302 FOR I=1 TO 18:POSITION 0,I:? "$";:
POSITION 39,I:? "$";:NEXT I:FOR I=0 TO
 39:POSITION I,1:? "$";
305 POSITION I,18:? "$";:NEXT I
306 FOR I=3 TO 16:POSITION 2,I:? "$";:
POSITION 37,I:? "$";:NEXT I:FOR I=4 TO
 16 STEP 2:POSITION 2,I:? "1";
307 POSITION 37,I:? "1";:NEXT I
310 FOR I=1 TO 18 STEP 2:POSITION 0,I:
? "1";:POSITION 39,I:? "1";:NEXT I:FOR
 I=0 TO 38 STEP 2:POSITION I,1:? "1";
315 POSITION I,18:? "1";:NEXT I:RETURN
400 RESTORE 425:POKE DL+23,PEEK(DL+23)
+128:FOR I=1663 TO 1683:READ X:POKE I,
X:NEXT I:POKE 513,6:POKE 512,127
405 POKE 54286,192:RETURN
425 DATA 72,169,14,141,10,212,141,22,2
08,169,0,141,26,208,169,224,141,9,212,
104,64
600 DL=PEEK(560)+256*PEEK(561):POKE DL
+3,PEEK(DL+3)+2:FOR I=DL+6 TO DL+23:PO
KE I,4:NEXT I
605 FOR I=DL+24 TO DL+28:POKE I,6:NEXT
```

```
I:RETURN
700 DATA 112,235,235,40,40,235,235,195
,195,104,195,195,235,235,40,40,235,235
,88,207,207,168,168,168,168,207,207
705 DATA 56,243,243,42,42,42,42,243,24
3,8,192,192,48,48,12,12,3,3,160,12,12,
48,40,40,170,40,40
707 DATA 24,20,20,85,85,85,85,20,20
710 DATA 32,255,255,255,255,255,255,25
5,255,136,170,170,170,170,170,170,170,
170
715 DATA 96,20,20,64,64,64,64,20,20,12
8,20,20,1,1,1,1,20,20,144,20,20,65,65,
65,65,0,0,152,0,0,65,65,65,65,20,20
720 DATA 168,130,130,0,0,0,0,130,130,1
76,5,5,60,12,15,12,51,34,184,60,60,255
,119,119,255,255,51
723 DATA 192,252,60,252,48,56,48,204,2
04
725 DATA 400,60,227,60,60,60,195,195,0
,800,165,165,165,165,90,90,90,90
745 DATA -1
750 POKE 106,PEEK(106)-8:GRAPHICS 0:ST
=PEEK(106)*256:RESTORE 700
755 READ R:IF R=-1 THEN 762
760 FOR I=0 TO 7:READ Z:POKE R+I+ST,Z:
NEXT I:GOTO 755
762 POKE 106,PEEK(106)-8:ST1=PEEK(106)
*256:RESTORE 770
764 READ R:IF R=-1 THEN RETURN
766 FOR I=0 TO 7:READ Z:POKE R+I+ST1,Z
:NEXT I:GOTO 764
770 DATA 112,235,235,40,40,235,235,195
,195,104,195,195,235,235,40,40,235,235
,88,207,207,168,168,168,168,207,207
775 DATA 56,243,243,42,42,42,42,243,24
3,8,3,3,12,12,48,48,192,192,160,48,48,
48,40,40,170,40,40
780 DATA 136,255,255,255,255,255,255,2
55,255,32,170,170,170,170,170,170,170,
170
782 DATA 192,252,248,252,48,48,56,48,4
8
787 DATA 96,20,20,85,85,85,85,20,20,12
8,20,20,85,85,85,85,20,20,144,20,20,85
,85,85,85,20,20
788 DATA 152,20,20,85,85,85,85,20,20
789 DATA 168,0,0,40,40,40,40,0,0,176,2
0,20,12,63,12,12,51,34,184,60,60,255,2
21,221,255,255,204
790 DATA 400,0,60,203,60,60,60,60,60,8
00,90,90,90,90,165,165,165,165
795 DATA -1
800 DATA 165,207,133,205,165,208,133,2
06
803 DATA 104,172,255,6,173,10,210,41,3
,201,3,240,53,201,2,240,65
805 DATA 201,1,240,33,240,0,169,100,14
5,205,200,208,2,230,206,177
810 DATA 205,208,17,169,50,24,145,205,
165,205,133,207,165,206,133,208,152,14
1,255
815 DATA 6,96,169,100,145,205,136,208,
227,198,206,76,188,6,169,100
820 DATA 145,205,152,24,105,40,144,2,2
30,206,168,76,188,6,169,100
825 DATA 145,205,152,56,233,40,176,2,1
98,206,168,76,188,6
840 RESTORE 800:FOR I=1684 TO 1789:REA
D X:POKE I,X:NEXT I:RETURN
1000 MA=MA-1:GOSUB 1600:IF MA=0 THEN 1
500
1005 W=W-1:GOSUB 100:GOTO 10
1500 POKE 559,34:SOUND 1,0,0,0:POSITIO
N 6,19:POKE 77,128:? "GAME OVER":IF ST
RIG(0)=1 THEN 1500
1505 SCO=0:MA=3:POKE 77,0:GOTO 7
1600 FOR I=44 TO 0 STEP -1:SOUND 1,20+
I*2,8,10:SETCOLOR 1,0,11-INT(I/4):SETC
OLOR 2,0,11-INT(I/4):NEXT I
1605 SOUND 1,75,8,15:ICR=0.79+6/100:V1
=15:V2=15:V3=15
1610 R=INT(RND(1)*15)+1:SETCOLOR 1,3,R
:SETCOLOR 2,3,R:SOUND 0,20,8,V1:SOUND
2,40,8,V2
1615 SOUND 3,70,8,V3:V1=V1*ICR:V2=V2*(
ICR+0.05):V3=V3*(ICR+0.08):IF V3>1 THE
N 1610
1620 POKE 559,0:FOR I=0 TO 3:SOUND I,0
,0,0:NEXT I:SETCOLOR 1,3,8:SETCOLOR 2,
0,0:RETURN
2000 POSITION 1,19:? "congratulations"
:POSITION 3,20:? "YOU HAVE WON":GOTO 1
500
2500 DATA 108,15,1,1,108,15,1,1,108,7,
128,25,144,25,162,25,1,15,81,15,0,0
2505 RESTORE 2500
2510 READ X,Y:IF X=0 THEN SOUND 2,0,0,
0:RETURN
2520 SOUND 2,X,10,15:FOR I=1 TO Y:NEXT
 I:GOTO 2510
3000 DATA 81,10,1,1,81,10,1,1,81,10,1,
1,81,20,91,45,96,10,81,50,0,0
3005 RESTORE 3000
3010 READ X,Y:IF X=0 THEN RETURN
3020 SOUND 1,X,10,15:FOR I=1 TO Y:NEXT
 I:GOTO 3010
7301 DATA 486,130,130,0,0,0,0,130,130,
494,5,5,60,12,15,12,51,34,502,60,60,25
5,119,119,255,255,51
```

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# microscreens

"Jim," a self-portrait by Jim Hood, is one of the most accomplished microscreens we've seen to date. To produce the drawing, a slide was projected onto the TV screen and traced. Embellishments were then made with **Micro-Painter**. This is Jim's second published microscreen.



"Greece," by Chyrene Pendleton, constitutes another second appearance in Microscreens. This stark but evocative scene was also executed with **Micro-Painter**.



"Ancient Civilization," by Edward Bever, was also drawn with **Micro-Painter**. Edward submitted a series of eight sketches that show the picture's developmental path. The background was laid down first, then details were added. Edward also writes product reviews for ANTIC.



## Make art with your Atari!

Create a microscreen with your Atari computer and see it published in ANTIC! Many techniques exist, including the use of commercial products such as **Micro-Painter, Graphic Master, PAINT, Fun With Art** and **Drawit**.* Or you may want to use **Keystroke Artist**, a graphics utility program that appeared in the August 1983 issue of ANTIC. Send your creations to Microscreens, care of ANTIC, on disk, and accompany them with loading instructions and a short biographical note about yourself. Good luck!

*Micro-Painter and Graphic Master are products of DataSoft, 9421 Winnetka Ave., Chatsworth, CA 91311. PAINT is a product of Atari, Inc. Fun With Art is a product of Epyx, 1043 Kiel Court, Sunnyvale, CA 94089. Drawit is a product of APX (Atari Program Exchange), P.O. Box 3705, Santa Clara, CA 95055.

# PAST PAGE SIX

## Safe storage areas for machine-language subroutines

by VERN MASTEL

Page Six is an area of RAM (decimal 1536–1791) in all Atari computers that was set aside for use by the programmer. It's special because it's protected — under most circumstances, the computer's other operations won't affect what's there. Dozens of utilities and subroutines have been written for Page Six. Unfortunately, it only contains 256 bytes, so room is limited.

If you need more space, the standard procedure is to move MEMLO (the beginning of the memory that is available to you for BASIC programming) higher, and fit the additional program(s) below this BASIC user space. The disadvantage of this procedure is that it takes memory space away from your BASIC program. Also, initialization and RESET routines must be handled correctly or the added code will be lost.

My technique allows those of you with DOS 2.0S systems to add many extra programs and/or routines. These will be protected from the Operating System, and will be unaffected by RUN, NEW, and pressing [SYSTEM RESET].

**SYNOPSIS**

*The techniques and memory locations referred to in this article pertain only to Atari DOS 2.0S, which is by far the most widely used form of DOS for Atari computers. Do not use these techniques with any other type of DOS (e.g., OS/A+, DOS XL, DOS 3.0, etc.).*

### STORING ROUTINES IN DOS RAM

The Disk Operating System (DOS) is nothing more than a collection of machine-language routines that perform functions such as reading the disk directory, coordinating disk input and output, and handling files. Some routines are used heavily, some hardly at all. Simply put, my technique locates routines in little-used areas of DOS RAM when you don't have enough room for them in Page Six. However, you must be very careful when you choose locations in DOS for your routines.

### SPECIFIC LOCATIONS

Locations 3033 to 3741 (decimal) contain the XIO routines that are used by BASIC to perform certain DOS functions. A total of 708 bytes are available here. However, if you use this space to store routines and then call DOS, you won't be able to use functions such as Rename, Lock, and Unlock, because the routines will have been overwritten. To avoid this problem, you can selectively overwrite the XIO routines you won't have any need for. You can find the source code for these routines in *Inside Atari DOS* by Bill Wilkinson.

Locations 5947 to 6043 contain the routine that creates MEM.SAV. There are 96 bytes here — enough to store a lot of short routines. And you'll never miss MEM.SAV.

Locations 6781 to 7419 contain the data and disk-drive buffers. Here you begin to tread on thin ice, because these buffers are used in various combinations, depending on which function of DOS is being used. Make sure that everything operates properly before committing your program to using this area. Otherwise, you may find that your "squatter" program has been evicted by the Operating System.

### FINAL NOTES

"Squatter" programs are usually unaffected by events within the Operating System. If you write DOS files to disk when a "squatter" is resident, the program is written right along with DOS. If you boot that disk, the "squatter" is loaded back into its proper place, and can be accessed as before.

If you wish to relocate routines from Page Six to DOS, you may need an assembler. Non-relocatable programs must be reassembled at their new location.

*Vern Mastel is the manager of a Team Electronics store in Bismarck, North Dakota, where he sells computers and related equipment. His favorite pastime is writing programs for the Atari.*

# PRINTERS AND SPOOLERS

## The more you spend, the more you save . . .

by DAVID and SANDY SMALL

As a professional programmer, your basic product is your time. The efficiency with which you use that time determines the number of jobs you can complete in a given period, which, in turn, determines your income. Your time is valuable — you cannot afford to waste it.

When we recommend certain time-saving accessories to fellow programmers, some of them are horrified at the cost. However, when you program for a living nearly anything that increases your efficiency is cost-effective.

### SAVE BY SPENDING

For example, the most expensive item that we recommend as a programming tool is the Corvus hard disk with 10 megabytes of storage capacity. It costs $3000, but it runs ten times faster than the Atari 810 and stores 128 times as much data.

Think of $3000 as 100 hours, or two-and-a-half weeks of your time, at $30 per hour. In one year, you'll save considerably more than 100 hours by using the Corvus. After all, in the course of a typical game's development hundreds of assemblies are accomplished, and each of these is delayed if it has to wait for access to a floppy disk. The Corvus can pay for itself by saving you that 100 hours of waiting for disk access.

### A NEED FOR PRINTING SPEED

Now let's look at printers, with speed as our primary criterion. Think of the number of times you've had to sit and wait impatiently for a printout to finish being printed. We used to waste a lot of time just watching the print head do its thing, because there was nothing else we could do. The computer was tied up, and besides, we couldn't tell what else needed to be done until we'd seen the hard copy.

### THE OKIDATA'S ADVANTAGES

We recently decided that we needed a faster printer than our trusty, but relatively slow, Epson MX-80. We ended up with an Okidata Microline 84, for the following reasons:

- It's a 132-column printer. Most assembler listing lines exceed 80 columns, especially if the program is adequately commented.
- The Okidata's speed is 200 characters per second (cps), and it features bi-directional seeking.
- It has a fast linefeed. This feature deserves further explanation, since it's the main reason that we didn't simply buy a faster Epson.

If you listen to an Epson while it's printing, you'll hear a "zzt," a pause, a "zzt," another pause, and so on. The "zzt" sound accompanies the printing process while the pause indicates that the Epson is slowly advancing the paper. It actually takes it longer to advance the paper than to print a line!

The Okidata, on the other hand, produces a sound more like "zzt-zzt-zzt." It feeds the paper very quickly. So while the Okidata is rated at 200 cps, and the Epson FX-80 at 160 cps, the real difference between the two is much greater than 40 cps.

- The Okidata's correspondence-quality printing looks very good. To achieve this effect, it overprints each line several times, which fills in the gaps between the dots. Keep in mind that a true daisywheel printer in this price range (about $1000) prints very slowly — about 10 cps. The Okidata's correspondence mode, on the other hand, works at 50 cps.
- The Okidata has a friction feed for non-tractor paper, such as letterhead. The MX-80 only handles tractor-fed paper.

These considerations were the most important ones for us in choosing our office printer. We've never regretted the decision or the $1000 we spent for the Okidata.

### THE ATR 8000

Our next goal was to free up the computer during the printing process. Normally, you can't do anything with the computer until a printout has been finished. But by attaching a device known as a spooler between the computer and the printer, you can start to use the computer almost immediately after beginning to print.

The ATR-8000, along with its many other capabilities, can act as a printer buffer. When you start to print, the

continued on next page

ATR accepts data from the computer at about 960 characters per second — or as fast as the computer can transmit it through the serial port. The ATR stores the data in its own memory. Meanwhile, a second driver in the ATR begins to dump its memory to the printer. Thus, ATR acts like a dam, filling at 960 cps and draining at 200 cps. The 64K ATR can hold 52,000 characters, while the 16K ATR holds about 12,000.

Once the Atari has finished sending data to the ATR, you can use the computer to do something else while the ATR continues to print automatically. If your text exceeds the buffer's size, you'll have to wait until 52K or less remain to be printed, but at least you won't have to wait for the entire printout.

## OTHER FACTORS

There are other spoolers on the market. However, none of them can match the ATR's many capabilities at the same price, which is why we recommend the ATR so strongly. Also, if you're looking for a printer interface, you should consider the ATR before purchasing an 850. It'll cost you more money, but you'll be much happier with the ATR in the long run.

Our cost for all of this equipment was about $1500, which is equivalent to about 50 hours of programming time. But by using the ATR and the Okidata in combination we easily saved that much in only one month of heavy use.

Epson printers have a strong reputation for durability and reliability. The Okidata matches this standard easily. In over a year of heavy use, it has never failed us. In fact, we found the Okidata's tractor feed to be slightly superior to that of the MX-80, because it is more trouble-free. The Okidata's only drawback is that it's rather noisy. If you can do so, it's best to keep it in a separate area, where the noise won't disturb you. One final tip: when the Okidata's ribbons wear out, insert a half-twist on either end and use the bottom, fresh part of the ribbon. This will double the ribbon's useful life.

## ON A BUDGET?

If $1500 is a little more than your budget can handle, we can recommend some lower-priced alternatives. The Okidata 92 printer, which retails for $595, offers 80 columns (132 in condensed mode) and prints at 160 cps. Again, it's effectively much faster than the Epson FX-80 (also rated at 160 cps), because of the faster paper feed. The 92 also has a very nice correspondence-quality mode.

In terms of interfaces and printer buffers, we still strongly recommend the ATR-8000, despite the expense. In the application noted above, the ATR was used only as a printer interface and spooler, but it can be expanded in so many different ways that it is an excellent investment for your system. If you cannot afford the 64K model ($500), get the 16K model ($350) and upgrade it when you can.

We hope you enjoyed this month's column. Please write to "Beyond the Basics" (formerly "Systems Guide"), in care of ANTIC, if you have any questions or suggestions. We enjoy hearing from you, and have learned a great deal from your letters. Please don't be offended if it takes us some time to answer; it's difficult to respond to all of the mail that comes in, but we do try.

*David and Sandy Small are professional programmers who work extensively with Atari computers and Atari-compatible peripherals and software to produce commercial software for the Atari. In Beyond the Basics (formerly Systems Guide), they share discoveries, insights, experiences and secrets of professional programming that should be of interest to others who are at or near their level of practice.*

# product reviews

## BRISTLES

First Star Software
22 East 41st St.
New York, NY 10017
(212) 532-4666
$29.95, 32K — cassette & disk

*Reviewed by George Adamson*

If you've got a burning desire to paint your walls, but don't want to clean up messy rollers or spilled paint, **Bristles** might be the game for you.

In Bristles, you control a painter whose task is to paint eight different houses in each of six skill levels — a total of 48 structures. You start with 10 brushes, and must race a clock to finish painting each house. To move between the different levels, you can either climb a ladder or ride an elevator. But be careful not to get caught in an open elevator shaft, or you'll be sent to the bottom of the shaft to start over. If you successfully finish a painting job, you receive two extra brushes.

It doesn't get faster in higher levels. Instead, Bristles offers more novel challenges.

Don't stand back to admire your work, or you'll be knocked down by "flying half pints" and "dumb buckets," among other dangerous objects that hinder your task and steal your brushes. You also have to contend with "Brenda the Brat," who delights in planting handprints all over your freshly-painted walls. Fortunately, she can be pacified with a candy cane and distracted just long enough for you to repair the damage. But your arch-enemy is the Bucket Chucker. He never stops chasing you, but you can trap him temporarily in — believe it or not — a paint mixer.

After each house is painted, a word or two appear. Complete an entire level, and the words form a message. The messages from all six levels combine to form a challenge that can only be met by the most persistent of gamers.

This game's action is fast and furious. It doesn't get faster in higher levels, though. Instead, Bristles offers more novel challenges, such as painting with varnish (it's invisible!), painting in the dark with only sound to guide you, and having to refill brushes when they run dry. Musical selections from Tchaikovsky's *Nutcracker* create an appropriate, if somewhat frantic atmosphere for this unique game.

## FORTRESS

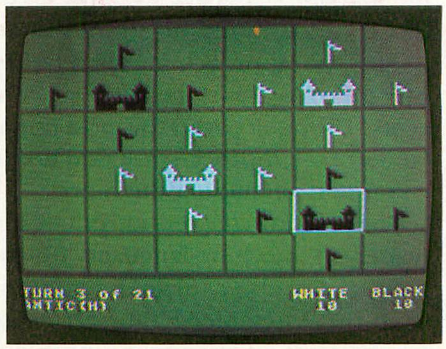
Strategic Simulations, Inc.
883 Stierlin Road, Building A-200
Mountain View, CA 94043-1983
(415) 964-1353
$34.95, 40K — disk

*Reviewed by Edward Bever*

You press the joystick button, and a castle appears in the cursor's square. Flags register your redoubt's control of the horizontally and vertically adjacent areas. Your opponent responds by placing a fortification diagonally adjacent. Two enemy flags appear on its far side; your two flags that are now next to both castles disappear. Whether you contest his effrontery by building your next castle nearby or concentrate instead on staking claim to as wide an area as possible, what follows will be a challenging battle of wits in which you alternate with your opponent building and reinforcing your castles. The object of the struggle is to establish control over a majority of the squares in a six by six grid.

Whenever two or more hostile castles occupy horizontally or vertically adjacent squares, the weaker one is eliminated. Because the attacker must have one strength point more than the defender, castles are easier to build than destroy. As the game progresses, the players solidify their control over most of the board while trying to bring superior power to bear on disputed squares. A game of **Fortress** lasts twenty-one turns, and whoever controls the most real estate at the end wins. A typical game takes only ten or fifteen minutes; tournaments of fifteen-game sets can continue for hours.

Fortress is good entertainment at parties, yet it rewards serious study as well. Two people can play against each other, or you can take on the computer. While two-person games are fun and can be quite challenging, the




solitaire version is clearly the program's centerpiece. You can choose between five opponents of differing skill levels and styles of play. These artificial intelligences actually learn from playing against you, and can be saved on disk to fight again. Hence, solitaire games usually are close matches. Novices and young children can enjoy playing against an opponent whose skill and intelligence begin as a blank slate, while strategy game fanatics will be hard put to best an opponent that has honed its skills over the course of almost nine hundred games.

Simple, fast, and well balanced, Fortress should appeal to anyone who enjoys a game that makes you think.

continued on next page

# product reviews

## MACHINE LANGUAGE FOR BEGINNERS

COMPUTE! Books
P.O. Box 5406
Greensboro, NC 27403
(919) 275-9809
(800) 334-0868 (except NC)
$14.95, book

*Reviewed by Matthew Ratcliff*

If you've considered taking the plunge into machine-language programming, consider **Machine Language for Beginners**. Author Richard Mansfield assumes that readers are familiar with BASIC, but have no prior knowledge of machine language. Throughout the book, comparisons in BASIC reinforce the machine-language examples. For those accustomed to thinking in BASIC, this approach makes it rather easy to pick up machine-language concepts. The book covers the most popular 6502 microprocessor-based home computers, including the Atari.

The first few chapters introduce the reader to machine-language fundamentals and also explain the monitor from the Assembler Editor cartridge for the Atari. "Appendix C" provides a Simple Assembler BASIC program listing to help you get started. This program allows you to type in, assemble, and run short machine-language examples presented in the text, and is much easier to use than the full-blown Assembler Editor, which beginning machine-language programmers often find confusing. Once you become familiar with machine language on the Simple Assembler, moving up to the Assembler Editor will be much easier.

One of the most difficult machine-language concepts to learn is "addressing," the way in which your computer accesses, transfers and operates on its many bytes of RAM (random-access memory). The text explains machine language's addressing modes with the help of an imaginary post office that routes all packages (bytes) to their proper locations (RAM addresses). This approach is effective and avoids the use of complicated diagrams and flow charts.

Chapters Five and Six explain the 6502's instructions, and present short examples to run on the Simple Assembler. "Borrowing From BASIC" shows you how to use common BASIC commands from machine language. Here, unfortunately, the author does not distinguish between BASIC ROM and Operating System (OS) ROM. The machine-language subroutine addresses in the Atari examples are in OS ROM, not in BASIC-cartridge ROM. They can be used with the Assembler Editor, or any other ROM-RAM configuration, since the OS ROM is never removed from the computer. The author overlooks this distinction, but he should have pointed it out because the Atari has removable BASIC ROM, while other machines do not.

> This book covers the most popular 6502 micro-processor-based home computers, including the Atari.

"Building a Program" presents complete machine-language listings and explains how they work. It includes a string-search utility for the Atari. Close study of the machine-language program and the USR call format will show you how machine language hooks into BASIC through the USR command.

The last chapter, "Machine-Language Equivalents of BASIC Commands," explains how to execute some of the more common BASIC commands from machine language without the aid of BASIC ROM routines. This will help you tackle your first complete machine-language program.

The book also contains some very helpful appendices. They provide a set of instructions, a quick reference guide and a partial memory map. The Simple Assembler BASIC listing mentioned earlier is followed by a disassembler that allows you to convert the bytes in your computer's ROM back into machine-language commands so that you can see how it works.

The book is definitely for beginners. It doesn't cover arithmetic very well, and it would have been nice to see an advanced programmer's appendix with appropriate routines. Once you become familiar with 6502 machine language, you will not progress much further without the aid of a more advanced manual. I suggest *6502 ML Programming* by Lance Leventhal. Because Mansfield's book covers five different computers, it becomes confusing at times and does not delve deeply enough into some subjects. However, *Machine Language for Beginners* presents the machine-language novice with a very good tutorial in simple, understandable terms.

## GO

Hayden Software Co.
600 Suffolk St.
Lowell, MA 01853
(617) 937-0200
$34.95, 16K — cassette
$34.95, 32K — disk

*Reviewed by Fred Pinho*

Go is one of the most ancient of board games. In Asia, and particularly in Japan, its popularity surpasses that of chess. While a game of chess involves a single tactical conflict, a game of Go consists of many interrelated battles. The game is played on a 19 by 19 grid, using black and white "stones" as playing pieces. There are many more pos-

# product reviews

sible moves in Go than in chess. It's also difficult to quantify the value of each move. As a result, the "brute force" approach used by programmers to create chess-playing programs doesn't work for this game. There are no expert computer versions of Go.

Unfortunately, this program does nothing to remedy the situation. Many basic Go concepts, such as the forming of two "eyes," or open areas, aren't even in the program's repertoire. As a result, I cannot recommend **GO** to any Go player who is beyond the beginner level.

As a general board-game program, I'd rate **GO** as fair, due mainly to a lack of documentation. What the Atari owner gets is the Apple documentation along with addenda and errata sheets for Atari play. The actual game demonstration consists of five short paragraphs. For a game as rich and complex as Go, this is clearly inadequate.

Again, the game's graphics are only fair, although its title screen is attractive. The game board itself is a simple grid. A series of menus allows you to choose various game options. The computer moves quickly, so game play is rapid.

In summary, this game is acceptable only for true lovers of board games and players who are new to Go. This is unfortunate, particularly since Atari's name is taken directly from Go (it's a term of polite warning).

## GATEWAY TO APSHAI

Epyx
1043 Kiel Court
Sunnyvale, CA 94086
(408) 745-0700
$39.95, 16K — cartridge

*Reviewed by David Plotkin*

Fantasy role-playing games have long been popular with computer gamers. In this type of game, you use the computer keyboard to guide your onscreen counterpart through various dungeons, caves, and so on, picking up treasure and weapons, and fighting all manner of monsters along the way.

Many have shied away from such games in the past because they rely on a complicated method of keyboard entry of commands. But **Gateway to Apshai** makes this fantasy realm accessible to a whole new audience. It comes in a cartridge form, and doesn't require keyboard input. Instead, you use the joystick to move your player and the fire button to take actions like fighting, unlocking a door, or checking your status. The console keys — [START], [SELECT], and [OPTION] — call up various status screens and allow you to select items from your supplies.

> Unlike most other games of this sort, the action can become fast and furious.

There are eight levels of play in Gateway, and you can choose from among 16 dungeons each time you enter a new level. You automatically enter a new level after 20 minutes of play, unless you choose to do so sooner. Your score increases as you pick up treasure. You start with five lives, and lose one each time your number of "health" points drops to zero.

The game's graphics and sound are very nicely done. Your warrior and his enemies are well animated, and you can actually hear your sword "swoosh" through the air. The screen scrolls smoothly as you move to keep your player centered.

Gateway to Apshai is exciting to play, with doors to unlock, and treasures, magic spells, and weapons to pick up. The weapons are most important, since you start with only a dagger. Eventually, you'll find swords, shields, and even bows and arrows in the dungeons. Unlike most other games of this sort, the action can become fast and furious. You may be forced to battle as many as three monsters at once in the upper levels.

This combination of role-playing and arcade action makes Gateway an exceptional value. Whether you're a dyed-in-the-wool arcade player looking for something different, or a master of role-playing games, I recommend Gateway to Apshai highly.

## MOVIE MAKER

Reston Software
11480 Sunset Hills Rd.
Reston, VA 22090
(800) 336-0338
$60.00, 48K — disk

*Reviewed by Peter Wickman*

"Tha . . . Tha . . . Tha . . . That's All Folks!" Porky Pig's familiar postscript still stirs the imagination, conjuring up images of wacky characters who are caught up in an endless round of sight gags. These rib-tickling routines last only a few minutes, but they are the result of weeks or months of careful planning and execution. Often, tens of thousands of illustrations are needed to tell a story. Each is then photographed separately in sequence with a movie camera and played back at normal speed. The result is an animated movie.

For most of animation's history, this work was done by hand. More recently, gigantic, complex and very expensive computer-animation systems were developed for scientific, and later commercial art purposes. Now, for the first time, an inexpensive, easy-to-use system for developing true animation is available for Atari home

continued on next page

computers. Even a young child can use **Movie Maker** to draw figures, set up individual animation sequences and combine the sequences into a short cartoon. You can even add music and title screens to your creations! If a utility program can be described as being absorbing, this one truly qualifies. You and your children will spend hours experimenting with the many effects made possible by this outstanding package.

This is not a Player/Missile development system. Rather, Movie Maker provides you with the tools needed to draw actors and backgrounds, create titles, and edit and produce sound effects for animated movies.

**Now, for the first time, an inexpensive, easy-to-use system for developing true animation is available for Atari home computers.**

Movie Maker is a menu-driven program that consists of four utility submenus: Compose, Record, Smooth, and Play. In "Compose," you create the shapes (actors) that you wish to animate. Several "paint" functions simplify the process of duplicating and modifying shapes in ways that suggest motion. And a "help bar" across the bottom of the screen provides you with information on the status of various functions.

Once you've filled the page with the shapes needed for your animation, you're ready to produce an animation sequence. You're allowed a total of 16 frames per sequence and nine sequences per animation routine in Compose. In the next section, "Record," you can expand these numbers considerably.

The Record section is where everything comes together. Here you control the action of up to six actors by using any combination of prerecorded sequences and moving actors across the background with a joystick. Add sound and titles, and you may have the makings of an Oscar winner. However, since this will probably be your first attempt at animation, your movie may fall short of your expectations. Fortunately, Movie Maker provides you with a selection of powerful editing commands that let you stop action,




move forward and backward frame-by-frame, delete material, change the tempo of the action, zoom and change color. All of these commands can be executed "on the fly" (while the action is in progress). Once you're satisfied with the results, the "Smooth" section removes the "flicker" from the finished product. You then use "Play" to display your animated masterpiece.

The program's only real flaw involves its use of sound. You can record only with sounds that are already present on the program disk — you cannot create new sounds. Other, lesser weaknesses include a few errors in the program's otherwise excellent documentation, and certain limitations on the use of color. Also, an actor can become lost in the background if both actor and background contain the same color.

Movie Maker is a very powerful program, and full mastery of it requires the concentrated effort of a dedicated animator. However, like all good programs, it allows you to produce pleasing results and to make progress at your own speed.

*ANTIC was so impressed with Movie Maker that we asked the Interactive Picture Systems people to design an animated greeting card for us, which they did to the delight of all who have seen it. Since then, IPS has agreed with Koala Technologies Corp. to make a version of Movie Maker for use with the Koalapad Touch Tablet. If you own a Koalapad or an Atari Touch Tablet, you may want to wait until that version is marketed, so that you can draw with the tablet rather than with a joystick.* —ANTIC ED

## RETURN OF HERACLES

Quality Software
21601 Marilla St.
Chatsworth, CA 91311
(818) 709-1721
$32.95, 48K — disk

*Reviewed by Richard Herring*

**The Return of Heracles** is an adventure set in ancient Greece. Accompanied by a 31-page manual of Greek history, it is chock-full of stories about men's attempts to please or circumvent the gods. Oddly, Heracles (more popularly known as Hercules) is not a character. His absence is one of the few mysteries about which the Oracle of Delphi is silent.

Your character can be one of several from Greek mythology, or you can use several heroes at once. Choose the ones you want with your joysticks. Given time (four to eight hours), even a novice player can complete the 12

tasks that are assigned by Zeus. The game challenges you to try to maximize your score by completing tasks in the least number of moves and without losing any of your heroes.

You must guide each of the heroes through dozens of graphics screens. When they are not busy slaying their foes, your heroes will gather treasures to pay for better weapons, armor, and heroic training. A full screen of information on the status of each hero is available. Various other characters also roam through the game. Often, they do not affect the fortunes of your heroes at all, but they sometimes turn the tide of battle.

You will face many dangers from other humans, animals, and the Olympian gods themselves. If you are to finish the game, you'll need a band of heroes who have been carefully selected for the individual strengths they bring to the group. For instance, the Great Ajax has enough brawn to subdue most foes, but Asclepius the physician is most handy to have around after a fight.

Return of Heracles contains enough background on Greek mythology to be truly informative.

Although it's not marketed as an educational game, Return of Heracles contains enough background on Greek mythology to be truly informative. Only a few characters — the rock man and the bulging blob come to mind — seem to be untrue to the game's roots: the myths of the ancient Greeks. And this program will definitely hook you! My only advice is to avoid the Whirlpool of Charybdis (it not only swept away all of my characters, it also crashed the game!), and to watch for the great graphics screen that is displayed when you finish the game.

## THE ARCADE MACHINE

Broderbund Software
17 Paul Dr.
San Rafael, CA 94903
(415) 479-1170
$59.95, 48K — disk

*Reviewed by Richard Herring*

**The Arcade Machine** is a menu-driven program that allows you to create each of the elements of an arcade game and then combine them into a coherent whole. The result will be an auto-boot disk that you are free to share with your friends. Just wait until you see that title page with your name in big, bold letters!

This program gives you an incredible amount of control over the details of your game. Its only major shortcoming is that it limits you to one genre — the **Space Invaders**, shoot-'em-up type. Your man or ship moves around the bottom of the screen and shoots up at an array of aliens or other targets. You can move over the entire screen, but you can only shoot up and down, and you can't restrict your ship's movements to predefined paths. A second player can control a ship at the top of the screen.

Up to five levels are possible in each game, and you can plan entirely new logic at each level. Only four colors are available; they also can be changed at each level. Depending on their size, you can create up to 24 aliens, each consisting of four shapes that are displayed sequentially to create animation. Two different shapes animate your player and the various explosions, and a sophisticated joystick routine enables you to draw game backgrounds on a blank screen. You can also enter text, draw points and automatically create geometric shapes. In addition, you can fill areas with single colors or patterns, and create vertically scrolling star backgrounds by pressing a few keys.

The Arcade Machine offers a wide variety of scoring and logic options. You can put a time limit on a game, or slow it down if it's too fast. Bombs can have various shapes and speeds, can bounce off certain objects, and can be smart or random. Each alien shape can have a different point value, and can be made to mutate rather than disintegrate when hit.

This program makes all the creative work easy. Its eleven menus take you quickly to the specific detail you want to modify. Once you work through the menus, you make some decisions by simply changing numbers in a columnar display, so it's easy to keep track of how a change relates to your game's logic. Separate worksheets, on which you can design shapes and paths, are provided, along with an 87-page manual. Best of all, when you finish your new game, you can submit it to Broderbund. In June, the authors of the six best games submitted will win prizes worth from $200 to $1500.

## ULTRA-DISASSEMBLER

Adventure International
P.O. Box 3435
Longwood, FL 32750
(305) 862-6917
$49.95, 32K — disk

*Reviewed by Fred Pinho*

**Ultra-Disassembler** is the opposite of an assembler. An assembler translates three-letter commands, or mnemonics, into machine language. A disassembler converts machine language into assembly language, to aid in

continued on next page

# product reviews

analyzing and modifying programs. Ultra-Disassembler does this well.

This menu-driven utility accepts machine code from three sources: binary DOS (non-boot) files, disk sectors and the computer's memory. Output can be listed to the screen, a printer or a disk file. Ultra-Disassembler provides standard Atari labels for all documented locations within the Operating System.

Disassembled output is structured so that reassembly will produce an exact duplicate of the original object code. The generated source code adheres to Atari Macro Assembler syntax. Other popular assemblers use different conventions for pseudo-operations such as .BYTE and .ORG, so a

**The documentation is well-thought-out, and instructions are clearly presented.**

customizer program is included. However, the customizer lacks the capability to change the equate directive.

Prospective buyers should be aware of a limitation that all disassemblers share, including this one: They have no way of distinguishing text and data from true machine instructions. Thus, output may contain some spurious instructions. It will still assemble properly, but it may be difficult for you to follow the program's logic. Disassemblers cannot do all the work for you. You must have a working knowledge of 6502 assembly language and the Atari Operating System to get full use of this software.

The disk and documentation are packaged in a high-quality padded three-ring binder. The documentation is well-thought-out, and instructions are clearly presented. Beginning with an example, they take you step-by-step through the utility. A discussion of the disassembler's limitations, and means of coping with them, is also included. Numerous examples are provided, and you are warned to make backup copies of the unprotected master disk. This is a thoughtful policy.

On the whole, Ultra-Disassembler works satisfactorily with no apparent bugs, but certain minor annoyances detract somewhat from its overall performance. For example, error messages are cryptic. After an error, you have to press [RESET] and reenter DOS to reload the program. And the computer locked up when I accidentally tried to load a source file.

Despite advertised claims, Ultra-Disassembler isn't really suitable for beginners. However, for intermediate to advanced users, I recommend Ultra-Disassembler as a useful and instructive tool.

## WAVY NAVY

Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827
(916) 366-1195
$34.95, 48K — disk

*Reviewed by David Faughn*

When you first boot the game disk, you may notice a number of similarities between **Wavy Navy** and Galaxian. However, Wavy Navy has its distinguishing features. Its graphics are more polished than Galaxian's, and the fact that you constantly move up and down on the waves as well as from side-to-side adds to the game's complexity.

Wavy Navy's scenario is a simple one: You are on a P.T. boat that is being tossed about on the ocean. Your objective is to shoot down waves of bombers that march across the sky (as in Galaxian and Space Invaders). Other exciting obstacles include missiles that swoop down upon you, helicopters that try to blast you out of the water, and floating mines that hamper your movements.

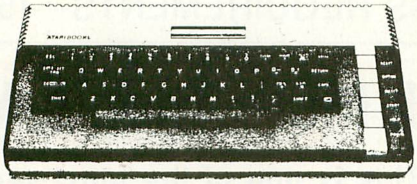
You earn points by shooting down the attacking bombers; extra points are awarded if you down an enemy plane during an actual attack run. You also get points for each P.T. boat left in your armada at the end of a round. If you survive a bombing wave, you advance in rank in increments from "galley slave" to President. But you may have to settle for an intermediate level, such as deckhand or gunner, unless you're prepared to practice long enough to hone your reflexes to a razor-sharp edge.

**You may have to settle for an intermediate level, unless you're prepared to hone your reflexes to a razor-sharp edge.**

If you already own Galaxian, you may want to spend your money elsewhere (unless you have a particular fondness for this game genre). But otherwise, you should be aware that Wavy Navy can provide you with many hours of challenging fun.

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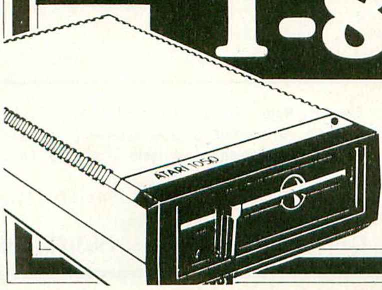
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|---|---|
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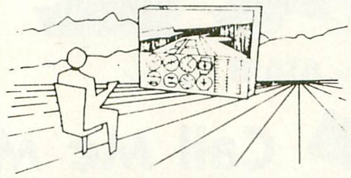
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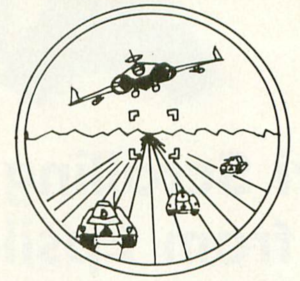
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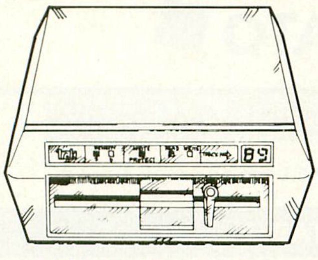
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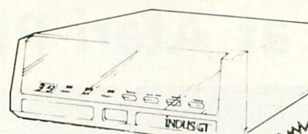
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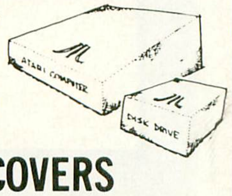


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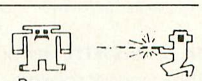
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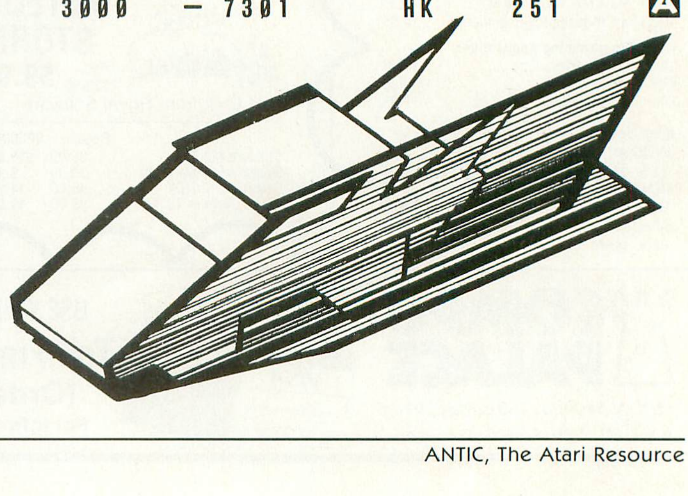
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**ARENA PSYCHOTICA** continued from page 87

## TYPO TABLE

Variable checksum = 300560

| Line num range | | Code | Length |
|---|---|---|---|
| 0 | — 10 | OP | 541 |
| 12 | — 30 | DZ | 553 |
| 33 | — 54 | EK | 518 |
| 55 | — 102 | UJ | 583 |
| 104 | — 200 | KQ | 588 |
| 205 | — 306 | FI | 586 |
| 307 | — 600 | GA | 504 |
| 605 | — 720 | HM | 553 |
| 723 | — 770 | ZW | 513 |
| 775 | — 800 | GK | 525 |
| 803 | — 1005 | LM | 514 |
| 1500 | — 1610 | BC | 581 |
| 1615 | — 2520 | FE | 508 |
| 3000 | — 7301 | HK | 251 |



# tangle angles

by CARL EVANS

*Tangle Angles is a collection of responses to letters from readers concerning use of tape cassettes with Atari computers. Responses are prepared by Carl Evans, ANTIC's Contributing Editor for the Tape Topics department. Tangle Angles appears intermittently as letters accumulate. Send your questions to Tangle Angles, care of ANTIC. Individual responses by return mail are not guaranteed, but Carl often obliges if you send a self-addressed stamped envelope. Otherwise, look for your answer in ANTIC.*

### HOW MANY?

When I read your article on head alignment (ANTIC, Aug. 1983), I ran into a problem. My plug has 13, not 15 pins. I tried what you said about counting the holes, but nothing worked. What am I doing wrong?

David Kaszuba
Copperas Cove, TX

*Whoops . . . you are right. The plug is a 13-pin plug, but that should not affect the alignment procedure. You may be misinterpreting the instructions. Try counting the holes from the other direction. Remember that you have to count one way on the computer end and the opposite way on the recorder end, so the holes will match each other.*

### LOOK FOR GOLD RINGS

I recently tackled your 410 recorder reliability upgrade (ANTIC, Feb. 1984). I had a few old cassettes that wouldn't load anymore. I put together a collection of one percent-tolerance, metal-film resistors and by tracing the etch, I was able to locate and replace the six resistors that your article specified. After completing the modification, all my old cassettes would load except one, which was probably due to poor oxide. I would like to point out that all the replaced resistors were five percent-tolerance (gold band) rather than ten percent, as mentioned in your article. The production date on my recorder is March 1982. Atari may have switched their 410's to five percent resistors since you got yours. Pass this information on so your readers don't try upgrading their recorders with five percent resistors only to find them already there.

Matthew Ratcliff
St. Louis, MO

*Thanks for the feedback. I am pleased that some readers are able to find the one percent resistors and make the mod without too much hassle.*

### MOVING UP

I own a cassette-based Atari 400 with 48K of memory. I would like to upgrade to a disk-based system. I need a utility that will copy all my cassettes to disk. Can you recommend such a program? Also will I need Atari DOS to accomplish this or will Atari BASIC be enough?

Roy Papendorf
Austin, TX

*Transferring cassette programs to disk is sometimes complex. If you will be satisfied with putting a single tape on one side of a disk, then I would recommend the program CASDIS, available from IJG, Inc. (714-946-5805) for $24.95. This program will create a working boot disk without you having to modify the cassette program. CASDIS works on many cassettes, but some companies have special garbage on their tapes to prevent you from ever doing an unload to a disk. CASDIS is a stand alone program and you don't need Atari DOS or BASIC to use it.*

### PLASTIC TRICK

My 410 recorder was used so much that the PLAY button would not stay down. Carefully disassembling the recorder, I found that the button pushed a thin piece of metal against a piece of plastic that activated the recorder. The metal had worn a groove into the plastic activator so the mechanism could not fully engage (I suspect many users will have this problem). I took the ink rod out of a ball-point pen, cut a small section off, and pressed the small piece over the metal rod. When I reassembled my recorder it worked fine! The ink rod acts like a cushion against the plastic. I have had no further problems, except that I occasionally have to eject the tape and reclose the door after a rewind or fast forward.

James Markow
Richmond, VA

*Your solution is rather ingenious. If you disassemble your recorder again, I suggest that you use some "liquid plastic" to fill in the worn section of the plastic activator. You can get liquid plastic at hobby shops and hardware stores.*

### TWO PORTS

I decided to get the new 1010 Program Recorder, hoping that Atari had corrected the erratic behavior of the 410. My question relates to the second I/O port on the 1010, what could it be used for? I tried hooking up my old 410, but I would always get an error 143 when using the 1010. However, I could load from the 1010 when I unplugged the 410. If this is the case, then what good is the second I/O port? One last question, what use is the PAUSE button???

Hisham M. Sa'aid
Frankfort, KY

*First, there is no possible use for a PAUSE button on a computer program recorder. The second I/O port, on the other hand, does have some potential uses. I use it for connecting my disk drives to my computer. Every connector introduces some amount of noise into the system and the closer the recorder is to the computer, the better it will work. Also, there are some printers that plug into the serial I/O port and the 1010 allows such a printer to be connected without a special expansion box or splitter.*

continued on next page

# tangle angles

## BOOT TO BINARY

I use CBOOTMGR to transfer my cassette programs to disk, but I am running out of disks because I can only put one game on each disk. Can you help me convert these boot files into binary load files?

Boyd M. Naron
Elk Grove, CA

*What you need is a utility program that converts boot files to binary-load files. Doing the conversions yourself is not a simple task. It requires you to understand file structures, as well as how programs are stored in memory. Many cassette files load into the section of memory that is occupied by DOS. Files like that have to be loaded with a special menu program. I will write about this later this year.*

## TRS TRANSFER

I own a TRS-80 Model I and use cassettes for program storage. A special utility sets the cassette baud rate to 3K. Is there anything comparable for the Atari? I am associated with a school that uses Atari's with 410 cassette recorders. I get impatient waiting for the Ataris since they operate at a slow 600 baud. Second, can I use a non-Atari recorder with one of the Atari 800's? Also, is there any way I can do my program development on my TRS-80 and then transfer the completed program to the Atari computer?

Charles V. Allen
Brighton, MI

*Let's take your last question first. If you are talking about BASIC programs, rather than machine language, it is possible to "write" a program on your TRS-80 and transfer it over to an Atari using a direct RS-232 connection or via the telephone using modems,* but *you can not "develop" your program on the TRS-80. The distinction is that you can write and transfer any pure ASCII file from one system to another; but, in the case of programs, the BASIC interpreters are different, so the transferred program can't be written to RUN on both machines. I have written programs on a TRS-80 Model I and transferred them over a direct RS-232 connection to one of my Ataris where I then "translated" the BASIC code so it would RUN. I have also performed the same operation in the other direction. The process requires a detailed knowledge of both computer systems.*

*As far as increasing the Atari baud rate goes . . . it is possible to use rates as high as 820 baud with a normal 410 recorder and up to 1200 baud with a good stereo tape-deck. The baud rate increase can be controlled by a program called V-COS, available from IJG, Inc. (714-946-5805). If you want to use something other than a normal 410 recorder, then you should use one of the special FSK interfaces like the one from Micro Systems & Software, Inc. (303-497-3440).*

## HIDDEN ACCESS

My computer teacher and I attempted to repair a late model 410 recorder and made a very useful discovery. We were having trouble aligning the heads because we were removing the plastic case to get at the alignment screw inside the recorder. We decided that the process would be easier if we drilled a hole just above the screw. We removed the metal label strip and found a predrilled hole already there! From that point it was a simple matter of repeatedly adjusting the screw and testing.

John Hanke
Cross Plains, TX

*You're right. I recommend that you check the alignment about once a year. If you leave the recorder in one place and don't bang it around, the head alignment should be all right for at least that long. Most recorders really need just a good head cleaning. If you want more detailed information on aligning heads, see my article called "Getting Your Heads Straight" (ANTIC, August 1983).*

## SCRAMBLED TAPES

The Atari program, **Eastern Front**, which I bought over a year ago does not load anymore. Several tapes I bought about that time will no longer load. I get mostly error 143 (checksum) and occasionally some other error code. On the other hand, I bought ZAXXON about six months ago and it loads fine. Also, any programs that I record myself will load okay. I cleaned the heads and I typed LPRINT before loading, but that did not work either. It is driving me crazy!

James Pantoni
New Cumberland, PA

*First, try to load those old tapes on another 410 recorder. If they won't load there either, then you probably scrambled the tapes somehow. If the tapes are bad, then you are stuck with replacing them. On the other hand, if the tapes* do *load okay on another recorder, then you probably need to align the heads on your recorder.*

## SLOW FLOW

I eventually got a photocopy of your HI-REL mod and used 2% resistors (scarce here). That helped, but I still had problems. I finally traced the problem to the computer itself. Two resistors, C166 and C167 were defective. I replaced them and I am now able to load programs, but only those which were saved with a LIST"C:" command. This is very slow. Can you help? Also, is there any way to interface my Atari 400 to a Sinclair Micro-Floppy?

Rob Pattison
Nausori, Fiji

*I am glad that you are finally able to use your system. My area of special knowledge is the recorder, I can't help you with the computer itself. I have never heard of a Sinclair Micro-Floppy. If any of you readers think you can help, please contact me or Rob through this magazine.*

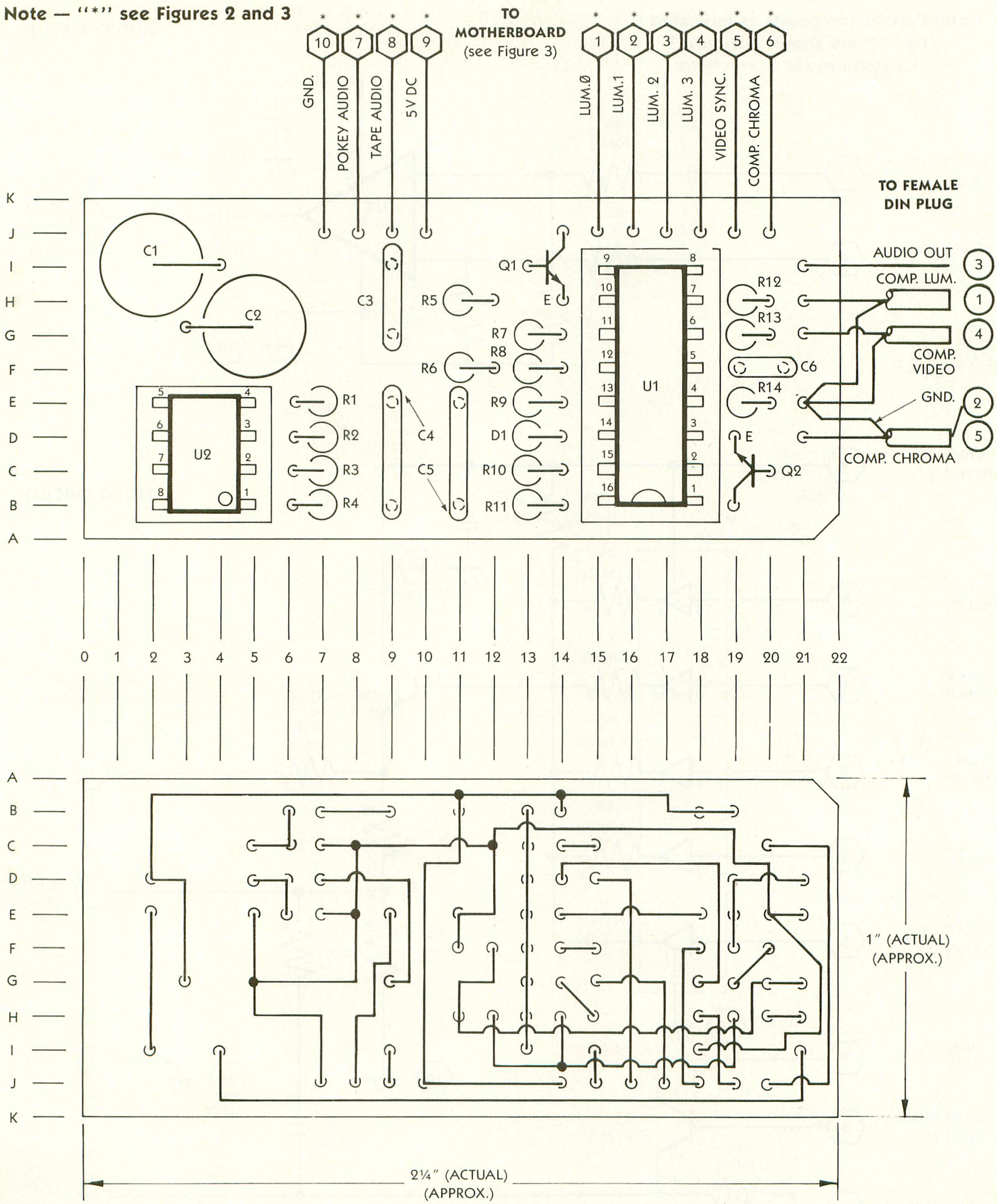



Figure 1

continued on next page

Figure 2

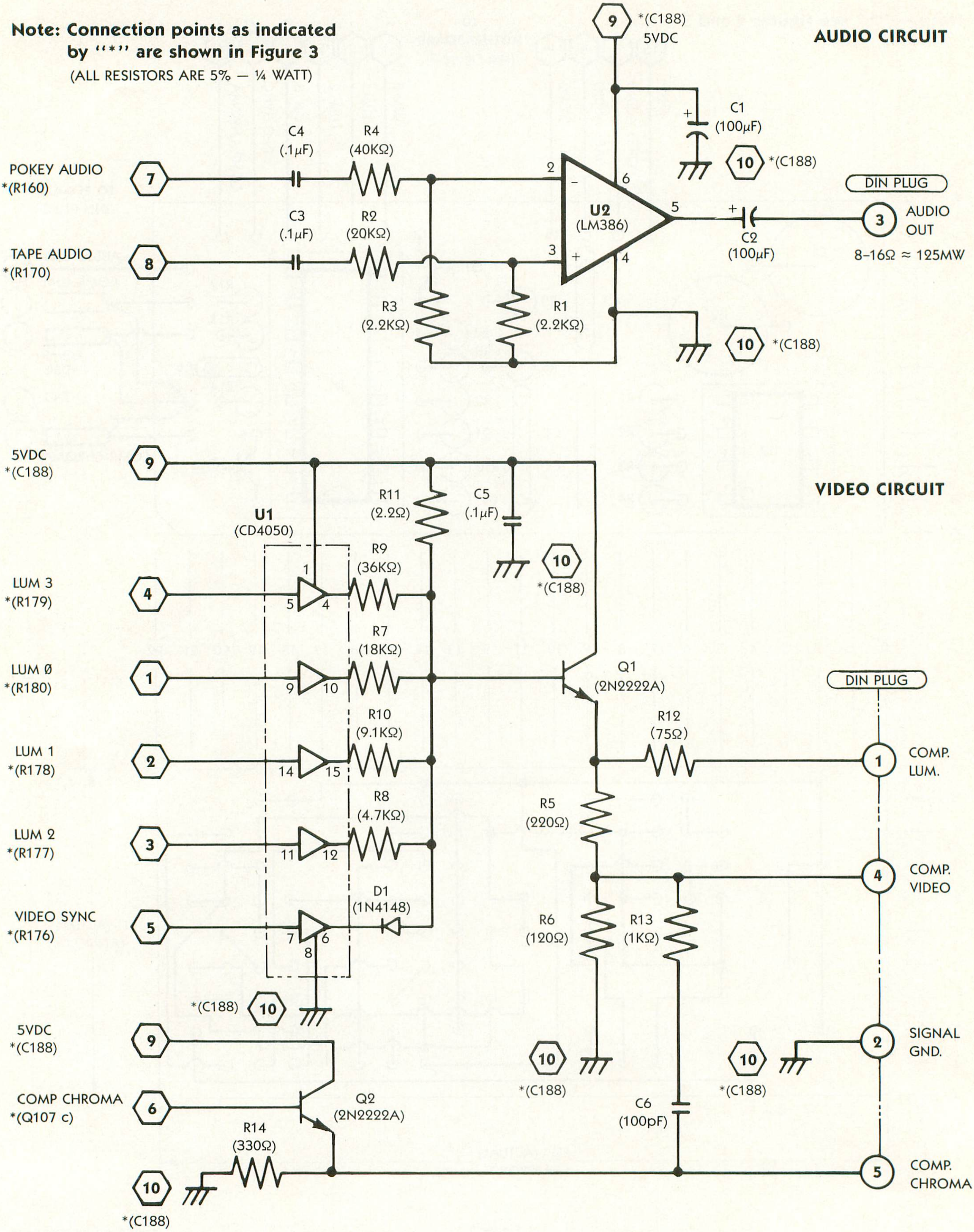
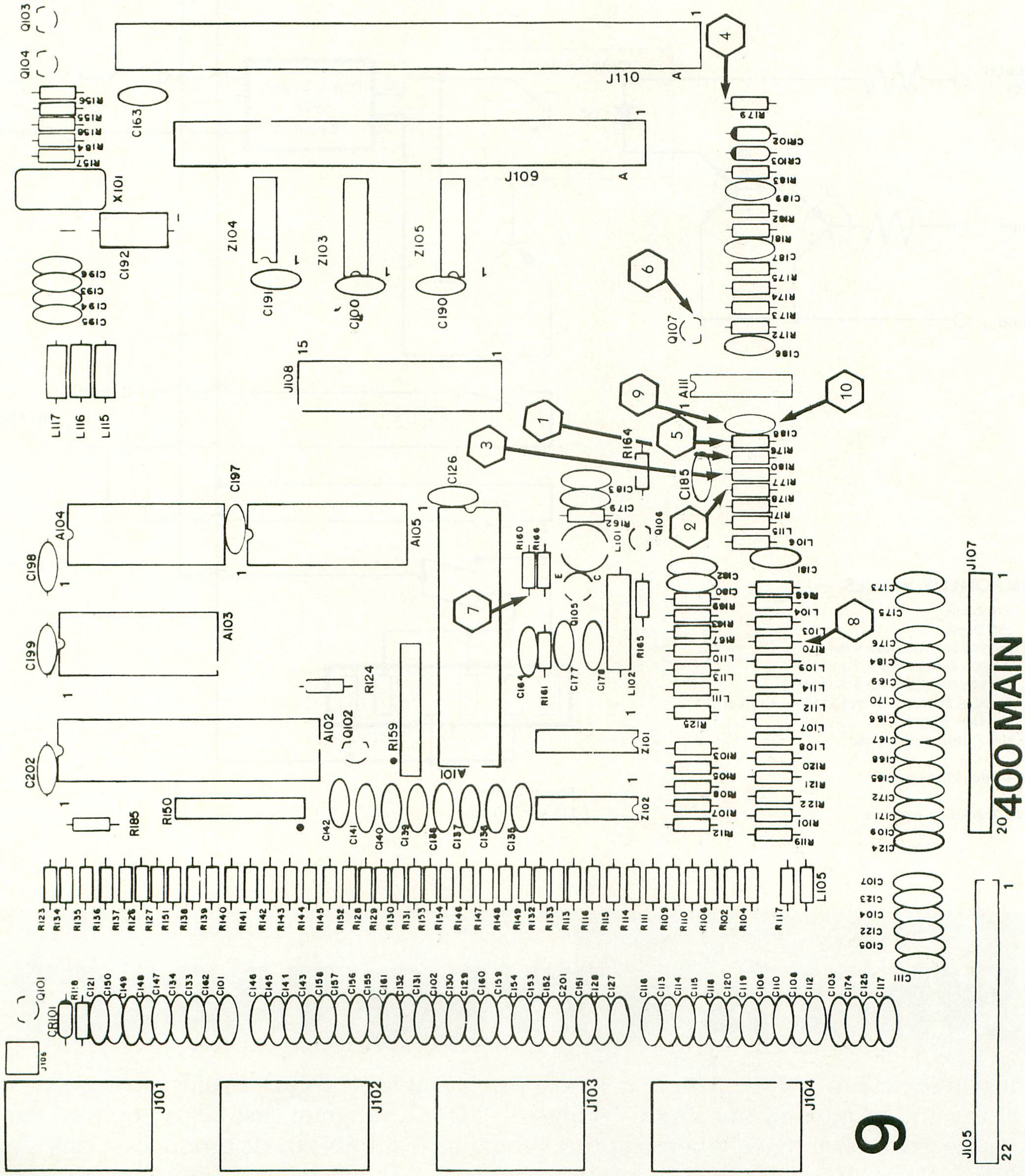

Note: Connection points as indicated by "*" are shown in Figure 3
(ALL RESISTORS ARE 5% — ¼ WATT)
AUDIO CIRCUIT
*(C188)
5VDC
C1
(100μF)
C4
(.1μF)
R4
(40KΩ)
POKEY AUDIO
*(R160)
*(C188)
DIN PLUG
U2
(LM386)
C3
(.1μF)
R2
(20KΩ)
AUDIO
OUT
TAPE AUDIO
*(R170)
C2
(100μF)
8–16Ω ≈ 125MW
R3
(2.2KΩ)
R1
(2.2KΩ)
*(C188)
5VDC
*(C188)
VIDEO CIRCUIT
R11
(2.2Ω)
C5
(.1μF)
U1
(CD4050)
R9
(36KΩ)
LUM 3
*(R179)
*(C188)
R7
(18KΩ)
Q1
(2N2222A)
LUM Ø
*(R180)
DIN PLUG
R10
(9.1KΩ)
R12
(75Ω)
LUM 1
*(R178)
COMP.
LUM.
R8
(4.7KΩ)
R5
(220Ω)
LUM 2
*(R177)
COMP.
VIDEO
D1
(1N4148)
VIDEO SYNC
*(R176)
R6
(120Ω)
R13
(1KΩ)
*(C188)
5VDC
*(C188)
SIGNAL
GND.
COMP CHROMA
*(Q107 c)
Q2
(2N2222A)
*(C188)
*(C188)
C6
(100pF)
R14
(330Ω)
COMP.
CHROMA
*(C188)

Figure 3

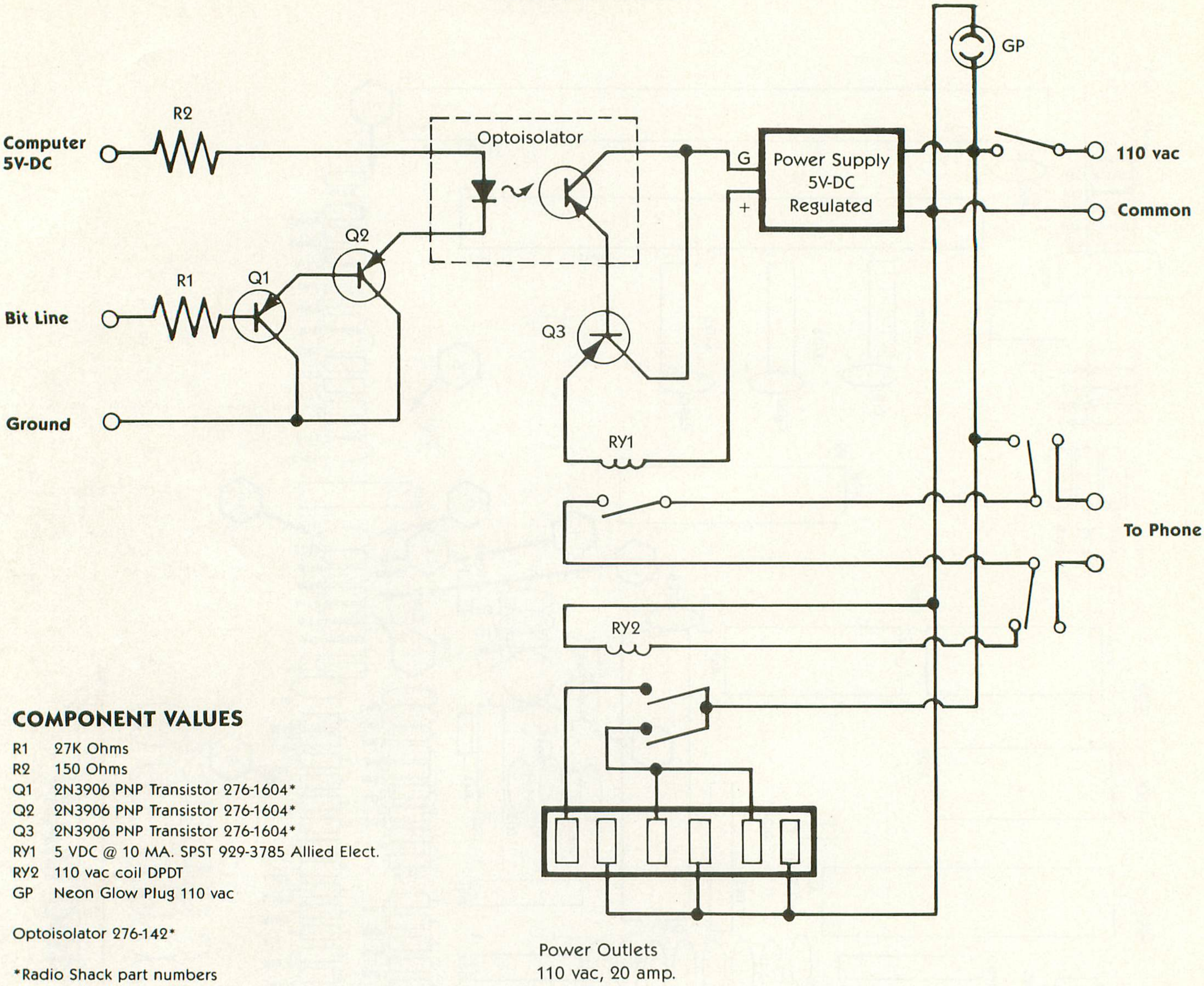
## MOTHER BOARD TIE-IN SCHEMATIC



**COMPUTER-APPLIANCE INTERFACE** continued from page 61

Figure 2

**CAI MAIN CIRCUIT**




## COMPONENT VALUES

| | |
|---|---|
| R1 | 27K Ohms |
| R2 | 150 Ohms |
| Q1 | 2N3906 PNP Transistor 276-1604* |
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| RY1 | 5 VDC @ 10 MA. SPST 929-3785 Allied Elect. |
| RY2 | 110 vac coil DPDT |
| GP | Neon Glow Plug 110 vac |

Optoisolator 276-142*

*Radio Shack part numbers

# What is a TYPO TABLE?

If you're new to ANTIC, you may be curious about the "TYPO TABLE" that appears at the end of most of our BASIC listings. TYPO is a program that helps you find the typing errors you make when entering programs from ANTIC. It produces a table of values that can be used to pinpoint the program segment where a line was entered incorrectly. The TYPO article and program listing appeared in the February 1984 issue of ANTIC ("TYPO," page 42) in our new listing format, and with improved instructions. It originally appeared in our August 1982 issue.

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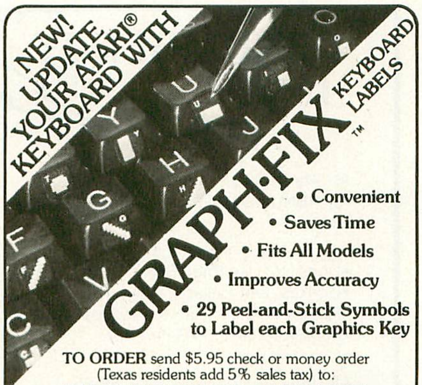
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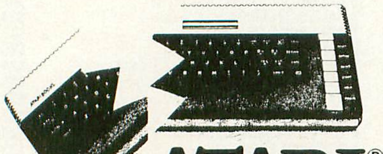
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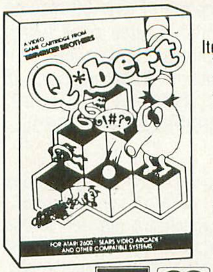
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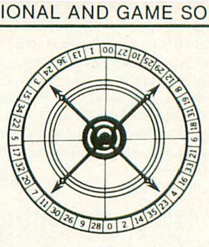
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# listing conventions

## Table Information

Our custom font listings represent each ATASCII character as it appears on the video screen. You generate some characters by a single keystroke, for example, the regular alphabet. Others require a combination or sequence of keystrokes. In this table, ESC means *press and release* the escape key before pressing another key. CTRL or SHIFT means *press and hold* the control or shift key while simultaneously pressing the following key.

The Atari logo key ( 人 ) "toggles" inverse video for all alphanumeric and punctuation characters. Press the logo key once to turn it on; press again to turn it off. In the XL line there is no logo key; inverse video is controlled by a key on the function row. Decimal values are given as reference, and correspond to the CHR$ values often used in BASIC listings.

### NORMAL VIDEO

| FOR THIS | TYPE THIS | DECIMAL VALUE |
|---|---|---|
| | CTRL , | 0 |
| | CTRL A | 1 |
| | CTRL B | 2 |
| | CTRL C | 3 |
| | CTRL D | 4 |
| | CTRL E | 5 |
| | CTRL F | 6 |
| | CTRL G | 7 |
| | CTRL H | 8 |
| | CTRL I | 9 |
| | CTRL J | 10 |
| | CTRL K | 11 |
| | CTRL L | 12 |
| | CTRL M | 13 |
| | CTRL N | 14 |
| | CTRL O | 15 |
| | CTRL P | 16 |
| | CTRL Q | 17 |
| | CTRL R | 18 |
| | CTRL S | 19 |
| | CTRL T | 20 |
| | CTRL U | 21 |
| | CTRL V | 22 |
| | CTRL W | 23 |
| | CTRL X | 24 |
| | CTRL Y | 25 |
| | CTRL Z | 26 |
| | ESC ESC | 27 |
| | ESC CTRL − | 28 |
| | ESC CTRL = | 29 |
| | ESC CTRL + | 30 |
| | ESC CTRL * | 31 |
| | CTRL . | 96 |
| | CTRL ; | 123 |
| \| | SHIFT = | 124 |
| | ESC SHIFT CLEAR | 125 |
| | ESC DELETE | 126 |
| | ESC TAB | 127 |

### INVERSE VIDEO

| FOR THIS | TYPE THIS | DECIMAL VALUE |
|---|---|---|
| | 人CTRL , | 128 |
| | 人CTRL A | 129 |
| | 人CTRL B | 130 |
| | 人CTRL C | 131 |
| | 人CTRL D | 132 |
| | 人CTRL E | 133 |
| | 人CTRL F | 134 |
| | 人CTRL G | 135 |
| | 人CTRL H | 136 |
| | 人CTRL I | 137 |
| | 人CTRL J | 138 |
| | 人CTRL K | 139 |
| | 人CTRL L | 140 |
| | 人CTRL M | 141 |
| | 人CTRL N | 142 |
| | 人CTRL O | 143 |
| | 人CTRL P | 144 |
| | 人CTRL Q | 145 |
| | 人CTRL R | 146 |
| | 人CTRL S | 147 |
| | 人CTRL T | 148 |
| | 人CTRL U | 149 |
| | 人CTRL V | 150 |
| | 人CTRL W | 151 |
| | 人CTRL X | 152 |
| | 人CTRL Y | 153 |
| | 人CTRL Z | 154 |
| | ESC SHIFT DELETE | 156 |
| | ESC SHIFT INSERT | 157 |
| | ESC CTRL TAB | 158 |
| | ESC SHIFT TAB | 159 |
| | 人CTRL . | 224 |
| | 人CTRL ; | 251 |
| | 人SHIFT = | 252 |
| | ESC CTRL 2 | 253 |
| | ESC CTRL DELETE | 254 |
| | ESC CTRL INSERT | 255 |

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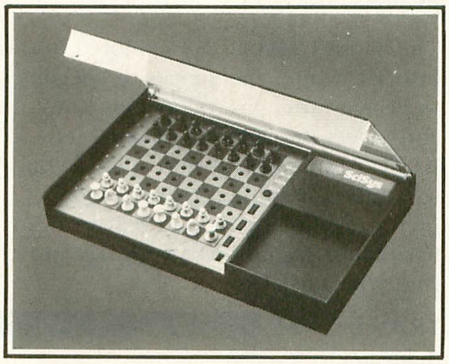
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New Product listings are compiled and written by Caitlin Morgan, Editorial Assistant. ANTIC welcomes submissions of products and information for this section of the magazine.

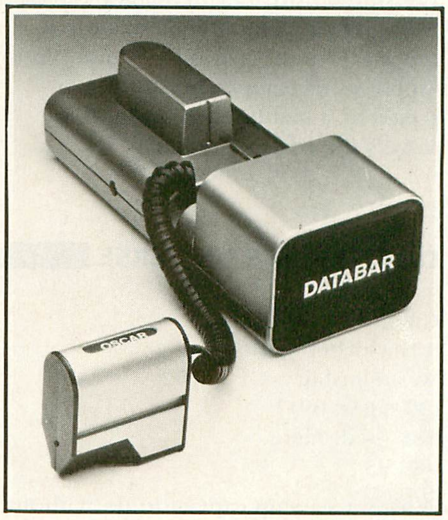
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continued on next page

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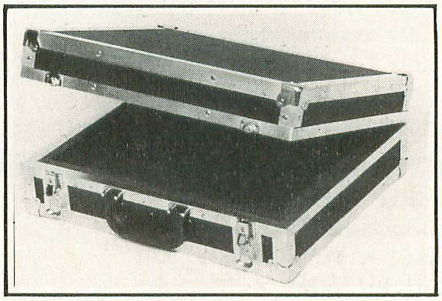
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(educational program)
MECA
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48K — diskette
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## OMNI ONLINE DATABASE DIRECTORY

(reference book)
Macmillan Publishing Co.
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New York, NY 10022
(212) 702-4212
hardcover — $19.95
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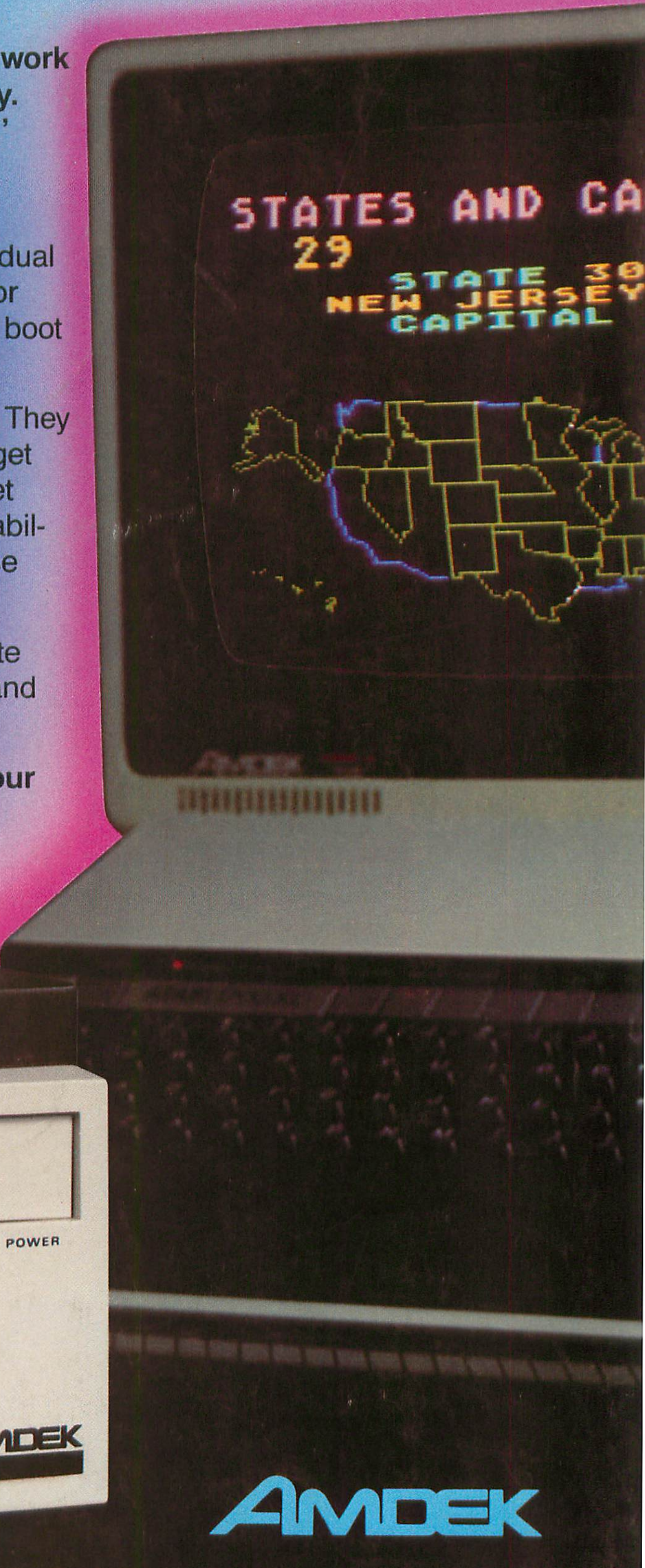
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